Surname Bjärhov

Bjärhov[1][2] is a surname that is derived by syllables bjär and hov. [3]

Bjäre Peninsula is a peninsula located in northwestern Skåne, between Laholmsbukten and Skälderviken. The largest part of Bjäre peninsula belongs to Båstad municipality[4] and the southernmost part belongs to Ängelholm municipality. Farthest to the northwest is the rocky area of Hov's halls. [5]

Hovs Hallar is a nature reserve on the northern tip of Bjäre Peninsula in the county of Skåne, Sweden[6]

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ERICSSON

KONTAKTEN

TIDNINGEN FÖR OSS INOM ERICSSON

NR 20 • 21 december 1995

Klonad ficktelefon

Ericsson har gjort det före någon annan – tagit fram en fungerande ficktelefon för både DECT och GSM. Telia i Sverige har beställt 5.000 telefoner för att testa marknaden. **11**

Ihärdiga förbättrare

Ericsson Cables i Hudiksvall är bäst i Sverige på kvalitet just nu. Så kan man tolka det faktum att företaget blev ensamma vinnare av Utmärkelsen Svensk Kvalitet för 1995. Bakom belöningen ligger ett ihärdigt förbättringsarbete. **14**

Nu kommer ryssarna

Ryssland har 149 miljoner invånare, men bara 16 telefoner per hundra invånare. När den ryska ekonomin nu börjar komma på fötter, är det en slumrande jättemarknad som vaknar till liv. Ericsson är på plats, inte minstinom mobiltelefonin. **16**

Miljonärer på förslag

Det lönar sig att lägga förslag till förbättringar. Det vet Tommy Tidehorn, Göran Söderlund och Staffan Åhlund vid Ericsson Telecom. De har belönats med två miljoner för sina kostnadsbesparingar på AXE10. **16**

Björn Svedberg, Ericssons styrelseordförande, deltog i festligheterna i Blå Hallen i Stockholm.

Guldglans i Blå Hallen

Ericssons guldmedaljfest är – efter Nobelfesten – årets största evenemang i Blå Hallen i Stockholms Stadshus. I år var antalet guldmedaljörer större än någonsin. 449 personer belönades för att ha arbetat i Ericsson i 30 år. De hyllades av bland andra styrelsens ordförande Björn Svedberg, själv guldmedaljör för ett par år sedan. **28** våra system för att därefter ansvara för att systemen är rätt installerade och konfigurerade under utvecklingsarbetet.

Utvecklingen av vår programvara kommer att ske i UNIX-miljö.

Du är förmodligen högskoleingenjör. Du är initiativrik och har god ordning och reda. Du har arbetat med UNIX systemadministrationtidigare.

PROJEKTLEDARE PRODUKTINTRODUKTION - GSM/DECT SYSTEM

Du blir ansvarig för planering och genomförandet av aktiviteter *relaterade till introduktionen av ett nytt system i RMOGs* produktutbud.

Detta innefattar bl a ansvar för framtagning av produktdefinitioner, beställningsunderlag manualer och kurser. Arbetet består till stor del av samarbete med andra enheter inom Ericsson.

Du bör vara en person som tycker om att skapa kontakter med andra människor och vara van att hålla igång många aktiviteter parallellt. Du har tidigare arbetat med projektledning. Erfarenhetav produkthantering inom ERA är meriterande.

CONFIGURATION MANAGEMENT - GSM/DECT SYSTEM

Arbetet omfattar hantering av delkomponenter för vårt nya system. Nya arbetsrutiner skall tas fram och finslipas. Rutinerna omfattar i första hand dokumentation och programvara inom vårt designprojekt. Dessutom kommer Du även att arbeta som kvalitets- ansvarig inom designprojektet.

Utvecklingen av vår programvara kommer att ske i en Solaris2/UNIX- miljö.

Du är förmodligen högskoleingenjör med några års erfarenhet. Du har god ordning och reda. Du bör ha arbetat med UNIX tidigare. Erfarenhet av Configuration Management är meriterande.

Kontakta: Michael Bjärhov tel 08-404 4203, ERA.ERAMBJA Ann-Charlotte Sturesdotter, Personal, tel 08-404 4191, ERA.ERAASTU

Ericsson Radio Systems AB

ORDFÖRANDE TILL PC-CMS30 – BU JAPAN

Inom CMS30 System Management söker vi en ordförande och/eller en sekreterare för att driva vårt högsta tekniska granskningsforum på systemnivå, PC-CMS30.

Arbetet innebär att Du driver, samordnar och administrerar forumet PC-CMS30. Ansvarar för den tekniska granskningen och godkännandet av dokumentation som tas fram i våra projekt. I arbetet engagerar du experter. Du ser över granskningsrutinerna för kontinuerlig förbättring. I arbetet med oss får Du en inblick i hela vårt CMS30 system, skapar kontaktnät samt får ansvara för ett centralt och viktigt tekniskt forum.

Du har en teknisk Ericssonbakgrund, gärna från systemlednings- arbete. Har arbetat med dokument som RS, IP, FD, etc. Kunskaper inom områdena mobiltelefoni, AXE 10 och/eller O&M är meriterande.

Kontakta: Björn Kaspersen ERA/JT/TUC. Memo: ERABKK. 08-757 14 92 Mats Lundin ERA/JT/TU. Memo: ERAMAT. 08-757 32 34. Ansökan skickas till: Zorica Bodiroza KI/ERA/J/H. 08-757 01 91

Ericsson Radio Systems AB, Kista

METODINGENJÖR

Tag tillfället i akt och var med när vi på CMS30 för Japan förbättrar våra metoder för "Early Design".

Arbetet innebär att Du utvecklar befintliga metoder för systemkonstruktion (TG0 till TG2) inom vår organisation, samt arbetar med att föra in de senaste och modernaste metoderna och stödsystemen inom området för krav- specificering, modellering och systemkonstruktion.

Du är kunnig inom AXE 10 utveckling och processer för tidig konstruktion. Förstår hur senare konstruktion och provning påverkas av vårt resultat. Kunskaper inom områdena: mobiltelefoni, FSAD, Objectory och/eller CMM är meriterande.

Kontakta: Björn Kaspersen ERA/JT/TUC. Memo: ERABKK. 08-757 14 92 Mats Lundin ERA/JT/TU. Memo: ERAMAT. 08-757 32 34. Ansökan skickas till: Zorica Bodiroza KI/ERA/J/H 08-757 01 91

Ericsson Mobile Communications AB, Kista

TEKNIK-/PROJEKTADMINISTRATÖR

Affärsenheten Mobile Data utvecklar, säljer och marknadsför system och accessprodukter för trådlös datakommunikation i flera cellulära standards. Våra terminaler, mobiltelefoner och radiomodem arbetar i flera system såsom GSM och Mobitex.

Vi vänder oss till dig som har ett kombinerat intresse av att jobba med både teknikadministration och som stöd åt våra projektledare i de tekniskt mycket intressanta utvecklings- projekten.

För den teknikadministrativa delen använder vi i huvudsak systemen PRIM och GASK. Det är fördelaktigt om du har kännedom om dessa system.

Det projektadministrativa arbetet innebär att du deltar i projekt- möten, samlar, bearbetar och distribuerar projektinformation av olika slag.

Du har tidigare erfarenhet av att jobba med PC och har kunskap i användningen av Excel och Word. det är också en fördel om Du har vana att jobba med arbetsstation. Bland dina personliga egenskaper skattas uthållighet och ordnings- sinne högt.

Kontakta: Kjell G Pettersson, tfn 08-7572990, memo: EC-SECSKGP Ansökan sändes till: Kristina Johnsson, KI/ECS/Y/HP

Ericsson Radio Systems AB, Kista

MEKANIST TILL MOBILTELEFONI – JAPAN BU

Vi söker en mekanist för konstruktion av mekanik till våra radiobasstationer som ingår i mobiltelefonsystemet CMS 30. Vi säljer vårt mobiltelefonsystem till den japanska marknaden med stor framgång.

I den dagliga verksamheten kommer du att ingå i en enhet som har till uppgift att konstruera såväl mekanik som kablage för fram- tida radiobasstationer. Vi ansvarar också för konstruktion av kylsystem samt förvaltning av tidigare konstruktioner inom mekanik, kylning och kablage.

Vi behöver nu förstärkas med ytterligare två mekanister. Du kommer i första hand att vara med vid utvecklingen av nya basstationer för både inom- och utomhusmiljö. Konstruktions- arbetet bedrivs i Unigraphics cadsystem. Till vårt förfogande har vi även en mekanisk verkstad där vi kan ta fram prototyper.

Vi vill att du som söker är gymnasieingenjör med några års arbetslivserfarenhet eller har högskoleutbildning med teknisk inriktning. Vi ser gärna att du har arbetat med mekanisk konstruktion tidigare. Har du dessutom arbetat med både kylteknik och vibrationspåverkan ser vi det som ett extra plus.

Kontakta: Mats Holte, tele 08/757 2398. Skicka din ansökan till: KI/ERA/J/H Ulrika Kvist.

Ericsson Mobile Communications AB, Lund

MEKANIST – KONCEPTSTUDIER

Ericsson Mobile Communications AB utvecklar, säljer och marknadsför mobiltelefoner över hela världen. Till vår enhet för Procuct Concept & Assembly Technology i Lund söker vi en mekanist.

Du kommer att koordinera och driva mekanikinriktade studier för framtida produkter. Arbetet kommer att ske i nära samarbete med de olika mekanikenheterna inom RMOT, varför god samarbets- och kommunikationsförmåga är av största vikt.

I arbetsuppgifterna, som är mycket breda, ligger bland annat koncept- studier, att driva kontakter med externa leverantörer och att delta i diverse expertforum rörande akustik och mekanik.

Din bakgrund är civilingenjör eller motsvarande med flera års erfarenhet av konstruktion. Som person är du idérik, självgående och har god initiativförmåga. Du har ett brett kontaktnät och behärskar engelska i tal och skrift.

Kontakta: Claes von Scheéle, tfn 046-18 14 39, för mer information om tjänsten. En skriftlig ansökan skickas till Lotta Sundahl, Ericsson Mobile Communications AB, 223 70 *LUND.*

Ericsson Radio Systems AB, Kista

INTERNATIONELL MARKNADSFÖRING MOBILTELEFONI TECHNICAL MANAGER

Vi arbetar med marknadsföring och implementering av mobiltelefonsystem i Central- och Östeuropa. På grund av den mycket snabba expansionen på våra marknader söker vi nu ytterligare några kundorinterade Technical Managers.

Du kommer att arbeta med våra mobiltelefonsystem GSM och NMT mot ett stort antal marknader och dotterbolag inom regionen. Detta innebär att Din uppgift blir bred.

Du kommer i stor utsträckning att arbeta med teknisk marknadsföring direkt mot våra kunder. Du kommer även att utarbeta de tekniska delarna av våra offerter och kontrakt samt under kundförhandlingar bidra med Din tekniska kunskap.

Arbetet kommer att vara mycket internationellt inriktat och omfatta en hel del resor.

För att lyckas med den här uppgiften måste Du ha minst ett par års erfarenhet av arbete med telekommunikationssystem (gärna AXE), radio/mobiltelefoni- eller datakommunikationssystem. Du är civilingenjör och intresserad av att jobba i en internationell miljö. Du behärskar engelska i tal och skrift. För vissa befattningar är kunskaper i ytterligare språk meriterande.

Kontakta: Ulf Borison, tel 08-757 15 80 memoid: ERA.ERAUBOR Anita Malmström, tel 08-404 24 29 memoid: QRA.QRAANMA Ansökan skickas till KI/ERA/LP/UH Anita Malmström

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KI/ERA/JT/T - Ericsson Radio Sytems AB

SYSTEMINGENJÖR, DRIFT OCH UNDERHÅLL FÖR PDC

Vi söker Dig som är intresserad av att ta utmaningen att utveckla drift och underhålls funktioner för den japanska marknaden.

Som systemingenjör arbetar du i de tidiga faserna av ett projekt med kravställande och funktions systemering på nätmodells nivå. Du kommer också att arbeta med tekniskt stöd vid kund förhandlin- gar och att följa upp hur systemen fungerar i drift. Arbetet kräver att man är drivande under projektet och är villig att ta tag i saker när behov uppstår. Mycket av vårt arbete bedrivs i nära samarbete med våra kunder, vilket ger oss möjlighet att direkt diskutera de tekniska kraven med dem.

Idag är vi en grupp på 4 personer som skall växa till 6 personer. Vi behöver främst personer med praktisk driftserfarenhet av AXE10 och/eller mobiltelefonisystem. Vi tänker oss att du har jobbat på systemverifiering av AXE10 baserade system, teknisk kundsupport eller nära en operatör.

Kontakta: Peter Dahlqvist tel. 08-7570139, memo ERAPDT Ansökningshandlingar skickar Du till Zorica Bodiroza, KI/ERA/J/H

Ericsson Radio Systems AB, Kista, Mobile Network Design and Product Marketing

PRODUCT MANAGERS

Enheten LP/S arbetar på världens alla mobiltelefonimarknader med att specificera mobila telefoninät för GSM,TACS och NMT. Vi arbetar huvudsakligen inom affärsprocessen och deltar i ERA/LPsaffärsverksamhet fr.o.m. pretenderfasen genom offert- och kundförhandlingsfasen och ansvarar frö telefoninätets dimensionering och design under implementeringen. När det är dags för våra kunder att expandera sin verksamhet deltar vi aktivt med att föreslå hur telefoninätet skall kunna växa på ett optimalt sätt.

Våra Product Managers arbetar med trafik- och kapacitetsberäkningar, dimensionering av IN-, switching och radionoderna och ansvarar för de djupare kunskaperna omprodukterna i vårt program.

Kundkontakter är en viktig del i deras arbete. De personer vi nu söker skall ha goda kunskaper i telefoni och ha mångårig erfarenhet av AXE-systemet. Kundpresentationer och förhandlingar är ständigt återkommande uppdrag vilket ställer krav på de sökande att vara utåtriktade och positiva i kontakter med människor. Koncernspråket är engelska.

Kontakta: Sture S Nilsson, tel 08 764 16 32 Liljana Sundberg, tel 08 757 24 59 Ansökan skickas till KI/ERA/LP/UH Liljana Sundberg

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Ericsson Radio Systems AB, Kista

The Product unit "Digital Switching Systems and Applications", (DSA), provides competitive switching, service control and application products to GSM/DCS/PCS operators through Ericsson/ RMOG marketing and sales channels.

DSA is fastly expanding to meet the global market. At our unit LK in Kista/Sweden we are now looking for:

TOTAL PROJECT MANAGER FOR DEVELOPMENT PROJECTS

We are looking for senior project managers for our main product releases within RMOG/DSA aiming at both our US and our European customers. The ability to have a helicopter view and to focus onthe essential issues are important qualifications for this very challening position.

Contact: Per Leking, phone +46 8 7572219, or memoid: ERA.ERAPLG, or fax +46 8 4047840. Kjell-Gunnar Königsson/ Human Resources, phone +46 8 4047946. Send your application and CV to KI/ERA/LK/HS Mia Hjertén phone +46 8 4047364, memoid: ERA.ERAMIHJ, or Fax +46 8 4047840.

Ericsson Business Networks AB, Sundbyber

PROJEKTÖR – PROJEKTLEDARE – DRIFTSÄTTARE

Enheten "Projektledning Försvaret" inom "Marketing & Sales & Sweden Projects" anställer för projektering, projektledning och driftsättning. Enheten har 40 anställda, är lokaliserad till Sundbyberg och Veddesta och producerar installationsunderlag och dokumentation för teleanläggningar.

Du som söker har teleteknisk utbildning på lägst gymnasienivå samt kunnande/erfarenhet inom områdena: Transmission, Radiolänk, Radioväxlar och Fibersystem.

Kontakta: Lars-Olov Andersson, tfn 08-764 3268, EBC.EBCLOAA ; Jan-Olov Lundberg, tfn 08-764 0310, EBC.EBCJOLU; Kurt Trogen, tfn 08-764 0811, EBC.EBCKUTR

Ericsson Microwave Systems AB, Kista

ANALOGKONSTRUKTÖR

Arbetsuppgifterna omfattar konstruktion (simulering i P-Spice), framtagning av tillverkningsunderlag samt konstruktions- verifiering av flygande utrustningar inom framför allt presentationsteknik- och telkrigområdena.

Du är erfaren gymnasieingenjör eller 80-poängs- till civiling, gäran med några års erfarenhet. Du har goda kunskaper i engelska samt god förmåga att uttrycka dig i tal och skrift. Beroende på kvalifikationer kan även objektledarssap ingå i arbetsuppgifterna.

Kontaktperson: Henrik Björnek, tel 08-757 07 62 eller Kurt Carlson, tel 08-757 28 30. Ansökan skickas till: KI/EMW/L/LZ Irene Adenborg

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Ericsson Microwave Systems AB, Kista

PROGRAMVARUKONSTRUKTÖR

Arbetet innebär att specificera, koda och test programvaruenheter ingående i motmedelssystemet eller presentationssystemet till flygplan JAS 39 Gripen. Programmeringsspråk är PASCAL-D80 och grafikspråk. Arbetet omfattar såväl underhåll som nyutveckling av tilläggsfunktioner. Du har några års erfarenhet av programmering i realtidssystem. Vi ser gärna 80- och 120-poängs ingenjörer som sökande.

Kontakta: Ulf Magnusson, tel 08-757 38 97 eller Peter Grunde, tel 08-757 20 18 Ansökan skickas till:KI/EMW/L/LZ Irene Adenborg

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Business Unit Network Engineering - ZNEP

SYSTEM DEVELOPMENT

The Business Unit Network Engineering is expanding rapidly with a large number of contracts for turn key projects in e.g. Far East, Pacific Rim, Middle East, Africa and Eastern Europe. New high-tech network solutions, like DRA 1900, DECT-based Radio-in-the Local Loop and broadband/CATV networks are included.

System Development within the BU is responsible for Product Provisioning and development of Support Systems and Methods to be used in the implementation of the projects.

In order to be able to meet the increased requirements from the Marketing and Sales organisations and the Project Implementation organisations we are now looking for candidates for the following positions:

SPECIALIST – RADIO PROPAGATION

EBC/Z is currently launching the DRA 1900 platform which is a small cell Radio-in-the-Local-Loop (RLL) system based on the DECT standard. To optimise installation methods, antenna techniques and study in service characteristics of the system from the propagation point of view we are now seeking a person with already in-depth knowledge of radio propagation who wishes to become our expert in the field. The work will be focused on defining and carrying out test programs and theoretical studies (both short and long term), analyse results and create prediction models in order to improve planning tools and processes. The work will be done in close co-operation with implementation projects and EMN in the Netherlands who are developing parts of the system. We believe that you have a Ph.D. degree or equivalent and an documented solid background in outdoor radio propagation research, e.g. with experience from studies of mobile telephone systems. Good co-operation skills and fluent English in speech and writing is a must.

Contact: Tore Mattsson, 08-764 0839, EBC.EBCTEMA Gert Eric Lindqvist, 08-7643252, EBC.EBCGRLI Richard Tersander, human res, 08-7640326, EBC.EBCTERS

SYSTEM ENGINEERS – RADIO & TRANSMISSION PLANNING

For DRA 1900 and other customer projects we are seeking two System Engineers to work with radio and transmission planning activities. The job consists of both "home planning" of the network using topographical maps as well as performing radio surveys and acquisition of planning data world-wide. Application software RAPS is used for microwave link planning and for radio calculations of the DRA 1900 network EET will be introduced.

Position 1 is a senior engineer and the successful applicant should have at least 4 years of experience in similar

KONTAKTEN
Ericsson, HF/LME/DI, Rum 811023, 126 25 Stockholm
Posttidning A

Rekordmånga guldmedaljörer

Årets Guldmedaljfest var den 52:a i ordningen. Den 1 december samlades 1 000 gäster i Stockholms Stadshus, där guldmedaljer för 30 års trogen tjänst delades ut av Lars Ramqvist och Björn Svedberg, med hjälp av fruarna Barbro och Gunnel.

Sedan 1952 har Guldmedaljfesten hållits i Stockholms Stadshus – i Gyllene Salen sker själva medaljutdelningen. Förutom medalj och en aktiepost får de belönade också en klocka eller ett guldarmband – efter eget val. Den pampiga ceremonin blir allt större, i år var det inte mindre än 449 personer som skulle få sin lön för lång och trogen tjänst.

449 guldmedaljörer fick sina pris under pompa och ståt

Middag i Blå Hallen

Efter festen avnjöts en pampig middag i Blå Hallen. Den ackompanjerades av högtidstal och underhållning. Björn Svedberg, koncernens styrelseordförande, höll högtidstalet som kretsade kring Ericssons utveckling de senaste 30 åren.

– 1965 när jag som ingenjör kom till Ericsson fick man sätta på sig en vit rock. Idag är rocken blå – vilken utveckling! inledde Björn Svedberg skämtsamt. Han satte på sig en blå ingenjörsrock och bläddrade igenom historiska diabilder.

– Trots att Ericsson redan för 30 år sedan fanns i 100 länder, var vi inte representerade i England, Frankrike, Tyskland, Nordamerika, Kina eller Sydafrika. Det är en fantastisk expansion som genomförts och som ni guldmedaljörer bidragit till! Tekniken ligger visserligen i botten, men det är uthålligheten, på gränsen till tjurighet, som ligger i botten!

– Idag kan vi konstatera, att egenskaperna professionalism, medmänsklighet och uthållighet tydligt kan skönjas i dagens Ericsson. Det är något unikt som ni, dagens medaljörer har bidragit med.

”Wow it's Monday”

Kjell Sörme höll i år medaljörernasracktal. Han är VD för Ericsson Australia.

– Många känner igen begreppet ”TGIF”, ”Thank God it is Friday”, men när jag en gång i tiden arbetade för Ericsson i USA myntades begreppet ”WIM”, ”Wow it's Monday”. Det är min och säkert många andras uppfattning av arbetet i Ericsson. Visst har det känts bra att komma till Ericsson.

– Att jobba i Ericsson kan jämföras med ett äktenskap. Man träffas, upptäcker att man trivs tillsammans, det bara blir så att det fortsätter, man lever ihop, har kriser, man får ömsesidigt utbyte och man trivs ihop. Jag är säker på att det känns så för många av oss ”30-åringar”.

Ericsson Events höll som vanligt i alla arrangemang kring festen – projektledaren Gunnel Eriksson kunde se tillbaka på ett lyckat evenemang.

– Det känns mycket bra. Allt har gått som på räls. Nu startar vi planeringen för festen 1996, då vi redan nu vet att det blir nytt rekord. Då blir det fler än 600 guldmedaljörer.

1 000 gäster hade samlats i Stockholms Stadshus för att fira de 449 guldmedaljörerna – för 30 år lång och trogen tjänst. Här avnjuts middagen i Blå Hallen.
Foto: Anders Anjou

Gulmedaljsmottagare Ernst Wernerz, Börje Isaksson, Dorothy Munther, Ove Ljung och Åke Skoglund. Nedan syns efterrätten bestående av glass och spunnet socker – och så Ericsson-loggan förstås.

TILL SIST

LARS-GÖRAN HEDIN

En pionjär drar vidare

I årets elfte timme kungjordes att Ericssons informationsdirektör sedan 10 år, Nils Ingvar Lundin, nu lämnar företaget. ”Ludde” tar sig an ännu en utmaning. Nu ska han göra maktbolaget Investor mer allmänt känt. Jag blir inte förvånad om detta företag om några år är ett av de mest omtalade i landet.

Ludde har inte bara betytt mycket för Ericsson, som under hans år blivit ett av de mest kända och mest uppskattade företagen i landet. Han har också betytt oerhört mycket för den tidning du just nu håller i handen.

Som ansvarig utgivare för Kontakten har han rent formellt alltid sista ordet i vad som ska eller inte ska vara med i tidningen. En rätt som jag tror att han aldrig utnyttjat. Han har litat på redaktionens eget omdöme istället för att själv detaljgranska vad vi skriver i tidningen. Det är ett praktiskt och för all del ganska vanligt arrangemang i den svenska tidningsvärlden.

Sin stora betydelse har Ludde haft genom att han, på uppdrag av dåvarande VD Björn Svedberg, formulerat och förankrat en informationspolicy som har ”öppenhet” som ett av sina grundläggande begrepp. I den andan har han också aktivt verkat för att ge redaktionen en relativt självständig ställning inom företaget. I det avseendet har han varit en pionjär inom svensk storföretagsamhet.

När det någon gång blivit diskussioner kring vad som skall sägas i en artikel, har han – som den journalist han faktiskt i grunden är – varit en det fria ordets försvarare. Inom vissa gränser förstås...

Kontakten är ju en företagstidning – den är företagets språkrör ut till de anställda och inte tvärtom, så den kan i det stycket ibland säkert upplevas som en ”Pravda” i koncernledningens tjänst. Det hör till sakens natur, men jag lovar att det finns många företagstidningar här i landet som upplever en avsevärt högre grad av styrning än vad Kontakten är utsatt för. Det är något vi som jobbar i redaktionen kan tacka Ludde för.

Lycka till, Ludde, i maktens korridorer! God Jul på Dig och Ett Gott Nytt År! Det sista får gälla alla Kontaktens läsare. Vi hörs...

Nye koncernchefen utsedd

Nu är det slut på spekulationerna om vem som ska bli ny koncernchef i Ericsson efter Lars Ramqvist. Det blir Sven-Christer Nilsson, chef för affärsenheten mobilsystem, amerikansk standard, som tar över. Ett namn som inte förekommit bland de externa förhandstipsen.

Som väntat kommer Lars Ramqvist att överta ordförandeposten efter Björn Svedberg, när Sven-Christer Nilsson övertar koncernchefsjobbet direkt efter bolagsstämman den 30 mars.

Arbetet med att få fram en efterträdare till Lars Ramqvist har pågått i mer än ett år. Styrelsens presidium och fackliga representanter har deltagit i processen som letts av Lars Ramqvist och Britt Reigo, koncernens personaldirektör.

Ett 20-tal tänkbara kandidater, de flesta interna, har bedömts under arbetets gång.

– Det finns många kompetenta medarbetare inom Ericsson, men bara en som kan bli chef, säger Lars Ramqvist i en kommentar.

Kundorienterad

Sven-Christer Nilsson har varit anställd i Ericsson sedan 1982. De senaste fem åren har han varit chef för en av affärsenheterna inom affärsområde Mobilsystem, affärsenheten för mobilsystem, amerikansk standard. Det är främst prestationerna i det jobbet som lett till att styrelsen under måndagen beslutade att just han skulle efterträda Lars Ramqvist.

– Sven-Christer är omvittnat omtyckt av kunderna och känd som en lyhörd chef, berättar Lars Ramqvist. Han är affärsorienterad och har visat en god marknadskänsla. En mycket utpräglad analytisk förmåga och förmågan att tänka strategiskt i fråga om såväl marknad som produktion och teknik är andra faktorer som motiverat valet.

– Och så vet vi från hans affärsenhet och från tidigare enheter Sven-Christer varit chef över att han är en bra ledare som har lätt att få med sig sina medarbetare. Han är en team-byggare som ger folk en andra chans och som ingen är rädd för, kompletterar Britt Reigo.

Tillträder efter stämman

Beslutet att utse Sven-Christer fattades av en enhällig styrelse. Under tiden fram till bolagsstämman kommer den tillträdande koncernchefen att tillbringa en stor del av sin tid på huvudkontoret vid Telefonplan i Stockholm. Han tillträder formellt det nya jobbet i och med att bolagsstämman avslutas den 30 mars.

Styrelsen föreslår till stämman att Lars Ramqvist utses till ny ordförande efter Björn Svedberg som därmed lämnar Ericssons styrelse efter mer än 20 år. Samtidigt utökas styrelsens presidium till tre personer, i och med att två vice ordföranden föreslås bli utsedda. De är Tom Hedelius och Marcus Wallenberg.

– På så vis får vi ett ännu starkare styrelsepresidium som kan backa upp den nye koncernchefen, lovar Lars Ramqvist.

Omtumlad

– Att valet till sist skulle falla på mig kom först som en mycket stor överraskning. Sedan jag hämtat mig och noga övervägt erbjudandet tackade jag förstås ja till detta, det finaste en Ericssonchef kan få, berättar Sven-Christer Nilsson.

– Min främsta ambition nu blir att slå vakt om kontinuiteten i företagets ledning, det vill säga att säkerställa den goda utveckling för koncernen som Lars Ramqvist och alla våra 100 000 medarbetare lagt grund till under sina åtta år som VD och koncernchef.

Efter en årslång process utsåg Ericssons styrelse Sven-Christer Nilsson till mannen att ta över rodret efter Lars Ramqvist. Foto: PETER NORDAHL

LARS-GÖRAN HEDIN

Sven-Christer Nilssons väg till toppen

1944

Sven-Christer Nilsson föddes 1944 i Malmö, där han växte upp, gick i skola och så småningom tog studenten. Då var det 1963. Efter militärtjänst och reservofficersutbildning blev det studier vid Lunds universitet. 1969 var han klar med en fil kand examen i matematiska ämnen och informationsbehandling.

– Jag var dataintresserad och läste bland annat numerisk analys med inriktning på datorkonstruktion. Det var den datautbildning högskolan kunde erbjuda på den tiden, berättar Sven-Christer.

1970

Första jobbet – ”det enda jag någonsin sökt” – fick Sven-Christer 1970 på Saab Scanias Datasaab-division i Linköping.

– Datasaab var den svenska IT-industrins vagga och en mycket framsynt satsning från Wallenberggruppens sida. Sven-Christer är övertygad om att det faktum att Sverige tidigt fick ett företag som konstruerade egna datorer har haft en oerhört stor nationalekonomisk betydelse.

Sven-Christer blev snabbt inblandad i arbetet med att etablera Datasaabs produkter, främst bankterminaler, på den internationella marknaden. Under 1975–1979 förde det honom ut på det första utlandsjobbet, i USA.

1979

Så började Ericsson förhandla om att köpa Datasaab och det blev, som Sven-Christer beskriver det, ganska rörigt i företaget en tid.

– Jag är en otålig person som vill se saker hända omkring mig, så jag lämnade Datasaab alldeles innan Ericsson tog över. Idag inser jag att jag kanske hade lite för bråttom, för det kostade mig chansen att få guldmedalj för 30 års tjänst i koncernen. Som det nu blev, får jag inte tillgodoräkna mig de åtta åren i Datasaab!

Just då, 1979, var Sven-Christer inte ledsen över att ha missat en anställning i Ericsson. Han fick nämligen arbeta med en av Sveriges stora entreprenörer. Det var Leif Lundblad, som med sitt företag Inter Innovation snabbt blev världsledande när det gäller produkter för sedelhantering. Leif Lundblads konstruktioner utgör än idag grunden för tiotusentals bankautomater runtom i världen.

– Det var mycket lärorikt att arbeta i ett så entreprenörsinriktat företag. Vi var hela tiden tvungna att skaffa oss intäkter innan vi kunde dra på oss några utgifter, minns Sven-Christer.

1982

Efter ett par år på Inter Innovation kom Ericsson ändå in i Sven-Christers liv. Han blev erbjuden ett jobb som marknads- och försäljningschef på RIFA, det som senare blev Ericsson Components.

– Det var verkligen intressant för en datakille som lärt sig hur datasystem fungerar på makronivå att lära sig hur de byggs på mikronivån.

1985

Detta år genomfördes en del strukturförändringar inom RIFA. Sven-Christer bytte jobb inom företaget och blev försäljningschef för standardkomponenter.

– Det gläder mig mycket att idag se hur Jan-Åke Wiklund och hans medarbetare på Ericsson Standard Components tagit tillvara alla de möjligheter vi såg för denna verksamhet redan i mitten av 80-talet. Idag är ju Ericsson Skandinaviens ledande företag på detta område.

1988–1989

En ny omstrukturering genomfördes inom RIFA, och kondensatorverksamheten avyttrades till ett finskt företag som också övertog själva RIFA-namnet. Samtidigt såldes Ericsson Information System till Nokia och 150 chefer blev utan arbete. Sven-Christers otålighet fick honom att avstå från att köa för nya uppdrag. Istället accepterade han erbjudande om en chefspost inom Philipson Bil.

Men det blev bara ett år utanför Ericsson. Sven-Christer var tillbaka igen redan 1990, nu som VD för det nybildade Ericsson Radio Systems Sverige.

– Efter att ha jobbat globalt sedan början av 70-talet var det underbart att få jobba i Sverige igen. Vi hade 30 filialer över hela landet, från Gällivare i norr till Malmö i söder. Och kunderna var av helt annat slag än tidigare – mina kontakter blev nu med droskägare, åkare och skogsbolag istället för med bankdirektioner och stora företags inköpsavdelningar.

– Under de här åren lärde jag mig mycket om att arbeta nära kunderna.

1992

Detta år värvades Sven-Christer till det projekt som startades för att skapa en affärsenhetsorganisation för affärsområde Publik Telekommunikation.

– Det var ett riktigt grepp att skapa en organisation som tog hänsyn till de olika drivkrafter som råder för olika produkter på olika marknader. Och som resultat av arbetet i projektet erbjöds jag och accepterade posten som chef för en av affärsenheterna, enheten Mobile Switching Systems.

Sven-Christer föreslog att verksamheten skulle flyttas över till affärsområde Radiokommunikation, där den enligt hans mening hade sin naturliga hemvist. Så blev det också.

– Utan den förändringen hade vi sannolikt inte klarat av de pressade leveranstiderna för de första GSM-systemen och för PDC-systemen till Japan. Det var nödvändigt att eliminera de hinder som tidigare skapats av att växlar och övrig radionätsutrustning hört hemma i olika affärsområden.

Följden av att verksamheten bytte affärsområde blev för Sven-Christers del att han för fjärde gången i karriären avskaffade sitt eget jobb. Nu gjorde det inte någonting, för han blev erbjuden posten som chef för en av Radiokommunikations nya affärsenheter, den för mobila system, amerikansk standard.

– Som alltid när jag bytt jobb dröjde det inte länge innan jag kände att detta var det roligaste jobbet hittills i mitt yrkesverksamma liv. Jag kommer att sakna min gamla affärsenhet, inte minst därför att där kunde jag och min ledningsgrupp för första gången i min karriär tydligt se det ekonomiska resultatet av våra åtgärder. Och här stannade jag länge nog för att uppleva hur resultatet utvecklades över en hel konjunkturcykel. Jag har fått se hur verksamheten vuxit fem – sex gånger i omfattning, hur vi kunnat bygga upp en stabil och god utvecklingsorganisation där enheterna i Montreal och Kista tagit ett mycket stort ansvar för våra produkters fortsatta konkurrenskraft.

– Och jag har sett hur lagarbete och gemensamma ansträngningar med att effektivisera våra interna processer resulterat i att tiden från idé till leverans för en ny produkt kunnat i det närmaste halveras, trots att produkterna för varje år blir alltmer komplexa! **LGH**

Ericsson Telecom AB Telefonplan

TENDER SUPPORT

Supply Centre Sweden provides a "one stop shop" for Marketing & Sales, the realization of the total TTC flow from planning to implementation. We focus on supply management, project co-ordination, logistics and customer solutions.

Our mission is to get our customers into business...faster. To achieve this we work with customer focus, in a cross-functional and team-oriented way. We are pioneers, the first Supply Centre, and our ambition is that we will always be first to adapt new ways of working.

Supply Centre Sweden has the operational responsibility for New and Global operators, the Nordic countries, Baltic, Central Europe, Middle East, Malaysia, Thailand, Pakistan and India.

● We are looking for some new members, to join Tender Support, who can take on the challenge to further develop our business. We can offer you an interesting and challenging job where you will be a key player in providing accurate and quick response to the request to quote from marketing units. The unit works with support of the tender in aspects of the operational resources. The operational resources are products, services and personnel, located externally and/or within Supply Centre Sweden.

Your main responsibilities and tasks will be Participate in developing the process of Tender Support to be able to respond to request to quote. Work in a network for Tender Support matters with suppliers such as Regional Centre´s, Supply Units and Original Equipment Manufactures in and outside Sweden Regional. Secure that agreed promises are followed up and feedback is provided from Market Units

You have at least a technical gymnasium degree and some years of working experience within Ericsson, preferably from Bid & Contract, Project Management or Marketing. You are used to the MS-Office package and are fluent in English. Experience from abroad and international knowledge is an advantage.

The positions requires technical experience and highly developed communication skills. Initiative, flexibility, ability to handle stress and good analytical skills are essential. You should be prepared to travel in and outside Sweden.

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Ericsson Telecom AB

CUSTOMER SOLUTIONS MANAGEMENT – TRAINEE

● Would you like to work with Technical Sales support towards markets in Middle Ease, Western and Central Europe or new/ global operators ? Then you are most welcome to our expanding unit at TN.

The Customer Solutions unit take full responsibility for the offered and contracted solutions towards all our existing customers. We are now seeking to strenghthen our customer teams with a number of people. We are looking for you who have some technical experience from other areas , for instance design, construction or testing. We will give you all the required training in a special program and you will belong to a customer team where you are supposed to also learn a lot.

We want you to be open, flexible and unafraid of new challenges. For more information please

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Ericsson Radio Systems AB

BUSINESS MANAGER

● A recent re-organisation within RMOG has opened up for new challenging positions within Market Operation Europe and Africa, existing customers (LG).

Within our Business Management units we are looking for experienced marketing persons to take on positions as Business Managers.

You will together with the Business Director be part of a team of 4-5 persons with the overall responsibility to secure successful long-term business with a number of our existing customers within our product area, mainly GSM.

Your main responsibilities and tasks will be: Together with the local companies establish business strategies and market plans for "your" customers. Support the Key Account Manager at the MLC (KAM) in marketing and sales activities locally and in Sweden. Push new products and solutions. Build relations with customers. Setting and follow-up of goals

You will have responsibility for 1-3 defined accounts within Europe. Your counterparts at the MLCs will be the KAM and his organisation as well as the general management.

The position requires substantial experience and knowledge in international marketing of telecom solutions.

Apart from being experienced in marketing you need to be an open-minded person, able to establish good relations with KAM organisation and customers. You are result oriented and have a strong drive. You are willing and able to travel regularly within Europe. In return you get the satisfaction of working in a flexible organisation devoted to the task of developing the mobile business for Ericsson within Europe and Africa.

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Ericsson Telecom AB

CUSTOMER SOLUTIONS MANAGER

● Would you like to work with technical sales support towards the new/global operators or some of our very interesting markets in Middle East, Western Europe or Central Europe ? Then you are most welcome to our expanding unit at TN.

As Customer Solutions Manager you take full responsibility for the offered solution to an existing customer. The work consists of an active role in establishing relations with your customer in order to secure the current and future network. You answer the technical questions and plan for the future solution.

We work in Customer Teams in close cooperation with account management, product management and project management. We are looking for you who have a broad knowledge and experience of solutions, focusing on switching. We want you to be open, responsive to customer needs and willing to share your competence with your team as well as learning from the other team members.

Contact: Victoria Strand TN/ETX/PN/OSC , ETX.ETXENV, 94103 or Kjell Östergren HF/ETX/PN/OSH, ETX.ETXKOSN , 09093

Ericsson Radio Systems AB, Kista

RMOG Customer Service organisation is responsible for marketing and development of total service solutions for mobile operator.

SALES SUPPORT MANAGERS SOUTH EAST ASIA AND THE AMERICAS

● As Sales Support Manager you will be responsible of business development and promote the marketing and sales of Customer Services within the countries in South East Asia and the Americas respectively. To provide commercial support to our local companies by assisting in tender preparations and participate in contract negotiations. Your role will be, to keep track of market development by visiting our local companies and customers and identify the market needs. Prepare marketing strategy and offer service solutions to our customers. For the position South East Asia the person should be prepared to move to the area.For the Americas its an advantage if you speak/read Spanish.

Qualifications: Formal education -MsC and/or MBA.

Experience: Work experience within the customer service area is preferable. Knowledge in operation of mobile networks. Be able to make presentations of our services.

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Ericsson Radio Systems AB, Sundbyberg

STRATEGIC PRICE MANAGEMENT TO ASIA PACIFIC

Business Management Middle East / Asia Pacific (ERA/ LO) is responsible for Asia Pacific business operations for products based on GSM, NMT and TACS standards.

● We are looking for the right candidate to work with pricing and business argumentation to perform the following activities: price comparison using the latest developed tool. argumentation to justify the price towards customers. packaging and pricing of new HW/SW-releases. to develop business cases for new SW-features. assisting our sales forces both in Sweden and local companies with pricing issues.

The successful candidate should have a master degree in industrial engineering or similar, flexible and awareness of other culture environment. English is a requirement.

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Ericsson Components AB, Energy Systems Division, Kungens Kurva

MARKNADSANALYS/ MARKNADSASSISTENT

Vi inom Power Modules utvecklar, marknadsför och tillverkar DC/DC-omvandlare för telekommunikationsområdet. Vår verksamhet expanderar kraftigt med ökande försäljningsvolym, nyutvecklade produkter och nya marknadsinbrytningar.

● Befattningen utgör en stabsfunktion inom Marketing och Du ansvarar för att kontinuerligt följa marknadstrender inom produktområdet för såväl geografiska som applikationsrelaterade områden och rapporterar detta i anpassade analyser. Du har även ansvar för att, insamla och kontinuerligt uppdatera information om såväl konkurrentföretag som kunder i en databas. Med hjälp av detta bedrivs sk. "benchmarking" för att mäta Power Modules konkurrenskraft och nyckeltal gentemot konkurrenter. Som verktyg till datainsamlandet står en bred tidskriftscirkulation samt inköp av diverse marknadsanalyser till förfogande. Bevakning av artiklar i tidskrifter är uppdelad inom sektionen men Du koordinerar och sammanställer. Dessutom skall du assistera vid upprättande av kontrakt av olika slag mellan produktenheten, produktleverantörer samt andra samarbetspartner. Detta sker i samarbete med chefer inom enheten och Ericssons juridiska avdelning.

Du som söker bör ha en god erfarenhet av marknadsprocessen, vara analytiskt lagd, ha erfarenhet av databaser samt besitta en god presentationsteknik. Engelska i tal och skrift är en förutsättning. Du är civilingenjör med marknadsekonomisk inriktning och eller har mångårig erfarenhet av liknande arbetsuppgifter

Kontakta: Lars Thorsell 08-7217045 memo EKA.EKALTL. Personalavdelningen Jan Uhlander 08-7216546 memo EKA.EKAJUP. Ansökan märkt K 97072: KK/EKA/K/P Gudrun Söderberg. Ericsson Components AB 164 81 KISTA - STOCKHOLM

Ericsson Radio Systems AB, Kista

TEKNISK MARKNADSFÖRARE – GSM INDOOR SOLUTIONS

● Dags att ta ett nytt steg i din karriär? Vill du ha ett jobb där du: får större personligt ansvar. kan utveckla ett brett personligt internationellt nätverk inom Ericsson. får utveckla dig som marknadsförare. får bred kompetens på applikationsnivå. kan utnyttja dina erfarenheter av mobiltelefonisystem. får jobba tillsammans med motiverade och entusiastiska medarbetare.

I takt med att framgången för GSM sprider sig över världen krävs lösningar för nya tillämpningar där våra CME20/CME40 system används. Marknaden efterfrågar nu i allt högre grad inomhuslösningar anpassade till offentliga och privata miljöer.

Vi sitter på produktenheten Base Station Systems (BSS) där vi ansvarar för spridningen av kunskapen om våra framsteg inom detta område samtidigt som vi inhämtar erfarenheter från marknaden, ofta via speciella projekt. Arbetet bedrivs i en internationell miljö, i samarbete med våra lokalbolag. Internt arbetar vi med ett brett kontaktnät som ser till att våra lösningar knyts ihop från planering och installation till färdiga tillämpningar i enlighet med våra operatörers önskemål.

Tjänsten som TEKNISK MARKNADSFÖRARE - GSM INDOOR SOLUTIONS innebär att Du marknadsför och introducerar våra affärskoncept med tillhörande lösningar för inomhusmiljöer samt kartlägger de drivkrafter som kommer att vara avgörande för en stark utveckling av marknaden.

Din huvuduppgift blir att skapa marknadsmaterial och sprida kunskap om vilka krav och förväntningar som ställs på inomhusapplikationer från vaggan till graven. Du kommer att medverka vid framtagning av olika tekniska lösningsförslag anpassade till den aktuella marknaden och applikationen. I detta arbete ingår också att återmata marknadskrav och erfarenheter till respektive produktägare inom produktenheterna.

Du är troligen civilingenjör. Det viktiga är att Du har erfarenheter och kunskap att förena teknik och ekonomi i en affärssituation. Du har ett utpräglat affärssinne och förmågan att självständigt planera och genomföra kvalificerade åtaganden. Du behärskar engelska i tal och skrift och är övertygande i din kommunikation. Du har under en tid arbetat tekniskt med mobiltelefoni och vill nu vidga dina vyer. Tidigare arbete i kundprojekt är meriterande.

Kontakta: Michael Bjärhov tel 08-404 42 03, michael.bjarhov@era.ericsson.se eller Ann Nordenstam, personal tel. 08-757 22 87 Ansökan: Ericsson Radio Systems AB LV/HS, Kerstin Almblad, 164 80 STOCKHOLM

Ericsson Radio Systems AB, Kista

MARKET ANALYST – CUSTOMER BUSINESS DEVELOPMENT

Business Unit Cellular Systems - American Standards (RMOA) is one of the fastest growing business units within Ericsson Radio Systems. We are the market leader for cellular telephone systems and services based on the D-AMPS/AMPS standard. Today, over 50% of the world's wireless subscribers are served by D-AMPS/AMPS systems.

The Customer Business Development department supports customers by helping them to improve their business. The department helps RMOA's customers to increase their market shares and profitability by utilizing our knowledge about what makes a wireless business successful in a rapidly growing, competitive environment. We are working in close co-operation with local Ericsson companies all over the world.

● To be able to achieve our goals, it is important for Customer Business Development to have good knowledge as to what is happening in the cellular market place world-wide. As Market Analyst, you will be responsible for providing that information internally within the department, but also within RMOA, local companies and to customers. Examples of focus areas are marketing, segmentation, pricing, and distribution strategies used by cellular operators on a global basis.

The applicant should be business oriented, have excellent analytical skills and have marketing experience as well as experience from an international environment. A university degree and fluency in English are required.

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Ericsson Radio Systems AB, Kista

BUSINESS MANAGER

JM/F SALES within RMOJ has the responsibility for Business Management, Order Management and Supply & Engineering. In order to meet the requirements at the Japanese market, we are at the moment implementing CORE 3, a way of managing our marketing and sales projects from start to completion.

● In order to seize the opportunities at the Japanese market, we look for a BUSINESS MANAGER. Main tasks are to work for increasing sales of our products and to support the local sales organisaion for the specific customer (Key Account).

As the ideal candidate, you will have both commercial and technical competence relating to switching and radio products. With regards to marketing and sales, you will be responsible for the co-ordination of all sales actives at ERA, contract care, support to the local sales organisation and co-ordination of prices structures, etc.

You are an outgoing, independent, self-motivated individual with strong inter-personal and communications skills. You should have a university degree, (engineering or business) along with three to five years telecom or datacom industry experience ideally from a similar position or in a position with dialy customer contacts. Fluency in English is required.

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Ericsson Radio Systems AB, Kista

GSM SYSTEMS SENIOR TECHNICAL MANAGERS

The business unit Mobile Telephony Systems GSM, NMT, TACS (RMOG) is now strenghthening it's efforts to maintain the world leader position within GSM.

In order to meet the increasing requirements on GSM system focus in our product/solutions offerings, the Product Units Digital Switching Systems (DSA), Base Station Systems (BSS) and Base Transceiver Stations (BTS) will create positions for GSM Systems Senior Technical Managers. We are looking for individuals with an overall understanding for the GSM system and GSM operators business situation. Preferably you have worked e.g as technical manager in a GSM Core Three team or aquired your GSM competence in other positions with direct customer contact.

● These new positions will have the following responsibilities: Team leader for the common Product Unit tender/negotiation team. Based on account managers analyses of the customer's strategies, indentify the solutions/products/services combinations that will win contracts. Develop operator business cases highlightning our solutions in comparision with the competition. Create and maintain a contact network.

The job requires fluency in spoken and written English. If you can handle other languages it is a merit. Most of your job (at least 50%) will be in close co-operation with our Business Management and Local Companies around the world. Thus, you must be prepared to travel and stay out for periods of 2-3 weeks at a time. A substantial part of your time includes rotation between the Product Units in order to keep you updated on the full GSM System characteristics.

The positions, which all are located in Kista, are open for both local employment and international assignments.

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Ericson Radio Systems AB, Kista

PRODUCT MARKETING, RADIO NETWORK

● As a result of the Diana project, RMOG is presently restructuring its organisation in order to increase competitiveness in the market in general and focus on New Accounts. For the Product Units, responsible for defining and developing the different parts of Ericsson's GSM system, this means a more pronounced responsibility for Product Marketing and Sales Support. In order to address this new role and actively promote Ericsson's products and solutions world wide, the Product Unit for Base Station Systems (BSS) is creating a separate Marketing and Sales Support unit.

We are therefore looking for you with experience in the Radio Network area, who are challenged by the task

As part of the team you must be an enthusiastic, supportive and creative team player and above all be both an efficient and effective administrator. You must be fluent in English (spoken and written), and have ability to work under pressure to meet deadlines. Ericsson knowledge and a well developed internal network as well as experience of events is expected. A communications background is recommended but not necessary. A technical background is an advantage.

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ERICSSON SVERIGE AB, STOCKHOLM

3G product marketing

Ericsson Sverige AB is Ericsson's new company for marketing in Sweden. We operate on one of the world's most exciting and most de-regulated markets, with an infrastructure for tele- and data communication that is under continual expansion.ericsson Sverige AB's customers are on the leading edge in tele- and communication and IP. They demand rapid delivery of services, products and solutions within these areas. Our customers are operators as well as private and public organizations in Sweden.

Approximately 600 people with strong customer focus work in the company. We have offices in towns including Malmö, Kumla, Göteborg and Nynäshamn. Our head office is in Kungsholmen in Stockholm.

● Product Marketing Managers and Local Product Managers for 3GWithin Market Unit Sweden we will now increase our resources to meet the challenges for 3rd generation mobile systems (3G), UMTS. Starting in the fall of 99 we are expecting UMTS pre-sales activities to really take off on the Swedish market, both for existing GSM operators and well as new players.

This means that we will increase our forces within GSM/UMTS product marketing and local product management with a few people mainly working in the following areas: UMTS Radio network (UTRAN). UMTS Systems solutions.

The positions involve product marketing and local product management activities in these areas. You will work in close co-operation with both account management and people at the product units. Close and frequent customer interaction is foreseen. The positions require good knowledge of GSM and preferably about 3G/UMTS. You should be able to combine commercial and technical knowledge of the Ericsson product offering with good business understanding of the operators` situation.

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ERICSSON COMPONENTS AB, KUNGENS KURVA

Account manager

Energy Systems utvecklar, producerar och marknadsför produkter för telekommunikation såsom strömförsörjningsutrustningar och -system, klimatsystem samt energiövervakningssystem och energirelaterade tjänster.

● Tjänsten innebär att du har ansvaret för försäljning mot internationella operatörer. Du kommer att ansvara för försäljningskedjan från offert till order inklusive avtal och kontraktsförhandlingar. Din uppgift blir att säkra goda kundrelationer med kunden.

Du som söker är en drivande och affärsorienterad person med lägst gymnasieutbildning och några års erfarenhet som kundansvarig säljare. Du har lätt för att knyta kontakter samt har goda kunskaper i engelska. Du har förmågan att se helhetsperspektiv och lägga upp strategier för försäljningen mot kunder av betydande storlek, där ett både brett och djupt kontaktnät är avgörande för framgång.

Kontakta: Matti Laine, 08 - 721 60 16, matti.laine@eka.ericsson.se, Kerstin Sandqvist (personal), 08 - 721 74 61, kerstin.sandqvist@eka.ericsson.se. Ansökan: K99097, Ericsson Components AB, KK/EKA/K/P Kristin Engh, 164 81 KISTA - STOCKHOLM, CV.energy@eka.ericsson.se.

ERICSSON RADIO SYSTEMS AB, KISTA

Manager

Ericsson Radio Systems AB, Kista - KI/ERA/AM/ITDMA Systems - is one of the fastest growing business units within Ericsson Radio Systems. We are the market leader for cellular telephone systems and services based on TDMA standards. Our main markets are in North and South America. Globally we are 9200 people.

Your primary task is to develop the strategic advertising and sales promotion efforts and campaigns for the TDMA Systems Business Units.

As manager of a team of three our four communications specialists you will provide support and leadership to a graphics co-ordinator, web content editor and several project managers.

The Marketing Communications department is a dynamic department in an exciting business unit and an explosive industry and as such have a high profile role in a fast moving and creative environment. As manager of Advertising and Sales Promotion Unit you will manage the project flow, execution, development, and budgeting of BMOA's advertising and sales promotion and support activities world wide. You must be able to work effectively in a cross cultural environment as co-operation and collaboration with diverse Market Units is an important aspect of the position. You should be professionally equipped to essentially offer

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ERICSSON RADIO SYSTEMS AB, KISTA

2 Copywriters for Marketing Information

Take part of the exciting future of mobile systems as a marketing information copywriter. If you have a flair for words, meeting deadlines, and some (or a lot!) of copywriting experience, then we have the places for two qualified people.

Your audience is a world wide customer base and Ericsson's own internal marketing and sales forces. You will be writing marketing guides, speaker's notes, and descriptions of our solutions for these. But, most importantly, you will work closely with projects and in launches of GSM system and wireless solutions on our ever-expanding markets.

● As copywriter, you will be a part of Marketing Communications in the Business Unit GSM Systems. Our collective task is performing a variety of internal and external marketing activities.

As we are introducing on-line services to internal and external customers, we expect you will be able to bring in and learn new methods and web-tools quickly, be organized, skilled in writing English, and quickly get the knack of understanding our customer's needs. Get your suitcase, some travel is required for this.

Come and join us in taking our industry-leading solutions into the 21st century.

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ERICSSON RADIO SYSTEMS AB, SUNDBYBERG

Project Co-ordinator

The unit, Market Unit Interface within Logistics Management (ERA/LV/L) has responsibility for supply-agreement between the Product Unit and the Market Unit, introducing and implementing processes and tools ensuring the success of the flow. It is also controlling the local performance on some key-performance indicators, both in quality, cost and heads.

The speed in the flow requires that our interface with our customers, mostly local companies (Market Units) is defined and well understood to the parties involved. The product unit, PU BSS has the responsibility of the TTC flow, all the way to the point when the nodes (AXE related products) are handed over to the costumers, both performance -and money wise, and needs to ensure the success of the TTC improvements.

● This is an opportunity to join a unit from the start. We are looking for a Project Co-ordinator with responsibility to introduce and implement processes and tools, enabling the Market Units to place orders directly to the Supply Unit AXE.

This position will offer you a possibility to work in an international environment with a high degree of own responsibility and co-ordination of different functions. You should have good knowledge in the Ericsson world and your profile is independent and self-motivated with strong inter-personal and communication skills. Experience from work at a Market Unit is an asset. Fluency in English is required.

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ERICSSON RADIO SYSTEMS AB, SUNDBYBERG

Sales & Marketing Support for the Enterprise Market

Help us unplug the LAN! We intend to make high performance LANs Wireless, to let portable computer users remain networked while on the move within the Intranet. In addition we will provide the travelling business people with company access from public Hot Spots. Wireless LAN Systems is a small and dynamic organization based in Sundbyberg. Individuals here have great possibility to influence their own work. We work in an international environment in close co-operation with research and design groups in Nurnberg and Gothenburg. Since end of 1998 we are selling WLAN products and will continue to develop, promote and sell WLAN solutions Worldwide.

● The Marketing & Sales Support Team within WLAN Systems needs a new member to strengthen the support for the Enterprise market. This is an independent position where your own drive and professionalism will be directly reflected in the business result. We expect you to develop and maintain the contact network with the market units and account teams, and to team up with this network in promotion and customer contacts. We believe you have some sales experience of datacommunication products to larger corporates in the international market. Sales experience from the Enterprise segment of Ericsson is a valued advantage! Experience from sales of Local Area Networks specifically is naturally a clear benefit.

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ERICSSON RADIO SYSTEMS AB, KISTA

Pricing Specialists

Ericsson Radio Systems AB, Kista - KI/ERA/AM/MPBusiness Unit TDMA Systems (BMOA) is one of the fastest growing business units within Ericsson Radio Systems. We are the market-leader for wireless systems and services based on D-AMPS/AMPS. Today, over 50% of the world's wireless subscribers are served by TDMA systems

● The Pricing Group is responsible for BMOA's global pricing strategy and price management. The group is involved in defining pricing strategies, pricing of new products, deployment of pricing strategies and supporting the sales organization with pricing argumentation, price comparisons and advice. We now need to strengthen our resources and are therefore looking for a pricing manager.

In this position you will analyze Ericsson's world-wide pricing structures and price levels. You will build up an in-depth knowledge about different markets, trends, underlying business and technological differences in mobile networks. Your knowledge will be used to support management, the sales organization and the pricing group with pricing information and analyses. Finding information, analyzing and initiating the appropriate actions are key words for your daily work. You will work with computer based models to create price and other comparison models, and you will work in close co-operation with sales representatives and the rest of the pricing group.

We are looking for a person with excellent analytical skills, a good business sense and an affinity with high tech products and services. A university degree, fluency in English and a service minded attitude are required.

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ERICSSON BUSINESS SYSTEMS AB, MARIEVIK

Marknadskommunikation

Ericsson Business Systems AB är ett svenskt lokalbolag ansvarig för försäljning av affärssegment Företagslösningars produktportfölj på den svenska marknaden. Vi är 75 st anställda och har fyra kontor, dessa finns i Malmö, Göteborg, Umeå och Stockholm.

● Vi söker en ansvarig för vår avdelning för marknadskommunikation, som består av tre personer. I Ditt arbete ingår att ansvara för idéer, utförande, uppföljning och budgetering för Ericsson Business Systems ABs samtliga marknadsaktiviteter i samarbete med vår Market Unit och våra partners. Du kommer i och med detta ha mycket externa kontakter. Du kommer även att vara assistent till marknadschefen och därmed ingå i marknadsavdelningens ledningsfunktion och aktivt medverka i avdelningens strategiarbete.

Du bör som person vara självgående, drivande, entusiastisk och nyfiken. En merit är om du har god kännedom om Ericsson koncernen och då speciellt Indirect Sales. För att motsvara våra krav, tror vi att Du har någon form av utbildning inom marknadskommuniktion, t ex IHM, RMI Berghs eller motsvarande högskoleutbildning. Då vårt koncernspråk är engelska kräver vi goda kunskaper I tal och skrift.

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ERICSSON COMPONENTS AB, KUNGENS KURVA

Marknadsanalytiker business intelligence

Energy Systems utvecklar, producerar och marknadsför strömförsörjningsutrustning, klimatsystem samt styr- och övervakningssystem för telekommunikation. Stabsenheten Strategic Marketing ansvarar för affärsenhetens strategiska planering samt för marknadspositionering mot kundsegmentet - Den tillverkande elektronikindustrin.

● Du skall koordinera ett Business Intelligence Council med deltagare från våra Business Lines, våra viktigaste lokala affärsenhetsrepresentanter samt våra egna Key Account Managers. Intelligence Council samlar in och bygger upp en faktabas om branschens marknadspotentialer, konkurrent-situation, kunder samt trender.

I Business Intelligence arbetet ingår att finna interface och samarbetsformer med EBIN, - Ericssons Corporate Business Intelligence Network

Du är Civilingenjör, helst Elektro eller Industriell Ekonomi eller erfaren Gymnasieingenjör. God dokumenterad marknadsförståelse gärna med erfarenhet av Strömförsörjnings- och/eller Telecom-branschen. Engelska behärskar du flytande i tal och skrift.

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ERICSSON RADIO SYSTEMS AB, KISTA

Affärsutvecklare – GSM office solutions

● Dags att ta ett nytt steg i din karriär?Vill du ha ett jobb där du: får ett större personligt ansvar, kan utveckla ett brett personligt internationellt nätverk inom Ericsson, får arbeta med marknadsföring på en expansiv marknad, får bred kompetens på våra totallösningar, kan utnyttja dina erfarenheter av mobiltelefonisystem, får jobba tillsammans med motiverade och entusiastiska medarbetare.

i är en liten avdelning på produktenheten Base Station Systems (PU-BSS) som ansvarar för marknadsföring av kompletta inomhuslösningar inkluderande allt från radionät till centralt kontrollerade slutanvändartjänster. i arbetar med lönsamhets- och paketeringsfrågor för att säkerställa att våra lösningar hanteras effektivt i alla led, från tidig marknadsföring tills att de utgör en fullt integrerad del av operatörens nätverk. rbetet bedrivs i en internationell miljö, i samarbete med våra lokalbolag.

Tjänsten som AFFÄRSUTVECKLARE - GSM OFFICE SOLUTIONS innebär många marknadskontakter för att säkerställa att våra lösningar tillgodoser kundernas krav. u kommer att ansvara för utveckling av modeller för lönsamhetsberäkningar, hantera priser, tariffer och annan marknadsinformation för våra tillämpningar. Resultaten används i kundmöten och presentationer för att påvisa lönsamheten av att investera i våra lösningar.

Du har en ekonomisk högskoleexamen. Du har ett utpräglat affärssinne och förmågan att självständigt planera och genomföra kvalificerade åtaganden. Du behärskar engelska i tal och skrift och är övertygande i din kommunikation. Du har under en tid arbetat med mobiltelefoni och vill nu vidga dina vyer. Tidigare arbete i kundprojekt är meriterande.

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ERICSSON MOBILE COMMUNICATIONS AB, KISTA

Strategic PR Manager Communications Department

Ericsson Mobile Communications AB is a company within the new Business Segment Consumer Products at Ericsson. Ericsson Mobile Communications AB develops, markets and sells mobile phones all over the world. To strengthen our Global Communications unit, we are creating a new exciting position as Strategic PR Manager.

● In this global role you will have overall (global) responsibilities for Issues Management, to formulate, coordinate and execute a global PR strategy for the Consumer Segment. You will be the one in charge of setting up plans and projects for

A suitable background ideally includes experience as journalist, from a PR business, working in the telecom industry or other relevant industries, preferably consumer industries. A genuine interest for new technology is probably important to be able to fully digest all our opportunities. As PR in its strictest form is part of an overall Communications plan it is important that the individual understand and appreciates how Marketing is performed and how it all integrates together. You need to be experienced in making presentations and you know the value

GSM network solutions for new-growth markets

Michael Bjärhov and Christer Friberg

The global number of mobile subscriptions is predicted to grow from 1.3 billion as of January 1, 2004 to more than 2.2 billion by the end 2008. Most of this growth will occur in emerging new-growth markets, which will drive penetration among the low-spending subscriber segment.

Two key technologies will cater for this subscriber growth: GSM (and its evolution to WCDMA) and CDMA. This focus of this article is on GSM technology, which has been deployed in every major market except Japan and Korea, has a strong market position with extensive availability of low-cost mobile terminals, and has an evolution path to increased capacity and faster data services.

The emphasis in new-growth markets is on increasing subscriber penetration, in particular, the segment of population which could not previously afford mobile telephony services or which lived outside of areas with mobile coverage.

Subscriber penetration in many "mature" markets is now saturated. So instead of focusing on growth in these markets, the main emphasis is on increasing revenue per subscriber by introducing advanced features and services.

This article describes the operator challenges and gives an in-depth description of how Ericsson's Expander Radio Coverage solutions can support operators when expanding into new, untapped markets.

Market characteristics

New-growth markets have several common characteristics: cost of capital is high, and a generally low gross domestic product (GDP) implies a high potential base of low-income customers. Despite government efforts to create sustainable rural cities, population growth in these markets is primarily concentrated to mega-cities.

Because the new-growth markets are cash economies, the most prevalent type of mobile subscription is prepaid. Some markets have only recently been deregulated, which means basic utilities and communications infrastructures are often lacking or based on aging technology. In some cases, the users have no previous experience of telephony. However, this does not mean that they are satisfied using dated technical solutions when services are introduced.

Analysts predict that the number of mobile subscribers in these markets will double between 2004 and 2008. Likewise, mobile traffic, they say, will more than double over the same period. Tariffs in these markets are often high, which leads to low penetration with relatively high average revenue per user (ARPU). In most markets, however, competition—often in combination with number portability—will drive tariffs down. Statistics show that thanks to the related subscriber growth, operators can maintain or even increase profitability as tariffs fall. One of the most important enablers of growth is the availability of low-cost terminals.

Today's operators have an opportunity to tap into this potential by deploying cost-effective coverage and capacity solutions. By adopting future-proof technology, they will also be able to meet the evolving demands of new subscribers. Existing operators, with established footprint and networks, are best positioned to acquire new subscribers. They can spread their costs and draw on economies of scope and scale. Although the current focus is on subscriber growth, these new subscribers also represent growing per-customer traffic and spending—after all, today's new users are the advanced users of tomorrow.

Operator challenges

Operators face several challenges in addressing new-growth markets. These challenges affect every area of operations and include business-, network-, and capital-related expenditures.

Subscriber acquisition

A substantial part of business operations focuses on signing up new subscribers. And perhaps the biggest obstacle is a lack of low-cost terminals. Another challenge in some markets is the perception that mobile phones are a luxury item—indeed, some countries apply luxury tax to mobile phones, which further inflates prices.

Charging and managing credit risk

Obviously, to generate revenues and positive margins, operators must be able to man-

BOX A, TERMS AND ABBREVIATIONS

BSS	Base station subsystem
CAPEX	Capital expenditure
CDMA	Cell-division multiple access
CDU	Combining and distribution unit
dTRU	Double TRU
EDGE	Enhanced data rates for global evolution
GDP	Gross domestic product
GPRS	General packet radio service
GSM	Global solution for mobile communications
KPI	Key performance indicator
MTBF	Mean time between failures
O&M	Operation and maintenance
OL	Overlay
OPEX	Operating expenditure
OSS-RC	Operations support system—radio and core
RAN	Radio access network
RBS	Radio base station
RX	Receiver
SMS	Short message service
TCC	Transmitter coherent combining
TRU	Transceiver unit
TRX	Transceiver
UL	Underlay
WCDMA	Wideband CDMA

age credit risk and prevent revenue leakage. Also, to compensate for expected low revenues per customer, they must have large volumes of subscribers. In practice, this means prepaid services for the vast majority of users, and a real-time charging system to prevent credit overruns. To minimize churn, operators must also consider what level of prepaid card denomination best encourages users to refill and retain their subscriptions. User spending control is also important, because it is doubtful that users can deal with unexpectedly large bills at the end of the month.

Distribution channels

Giving people convenient and simple ways of refilling their subscriptions is essential. High-cost refills and a lack of dealers and refill channels are barriers to usage. Starter packs should be promoted and made available through many channels. This is more easily accomplished with prepaid or hybrid packages than with post-paid subscriptions. Prepaid offerings are easier to distribute, sign up and activate because they do not necessitate contracts or credit checks.

Service differentiation

Service differentiation, which is about providing the right services to the right segments, plays a vital role in attracting first-time users and profitably addressing new subscriber segments with lower spending levels. The service mix can be used as a differentiating factor, but the services themselves must never skimp on quality. Operators who use voice quality and grade of service as differentiators risk greater churn.

Radio network infrastructure

Many new-growth markets face two fundamental network-related challenges. These are a lack of radio coverage in rural areas, and the need for greater capacity in densely populated areas. Other challenges arising from serving a low-income customer base include lack of financing for new technology, and excessive competition, which erodes profit margins. The challenge is to adjust the cost structure needed to acquire necessary features and functionality while remaining profitable at subscriber spending levels of less than USD 5 per month. This means low production cost per minute of use (MoU) and high utilization of network resources. Network equipment typically accounts for the largest share of capital expenditures (CAPEX)—some 50 to 80 percent of a mobile operator's CAPEX is network-related. For operators in new-growth markets, radio access makes up the biggest part of investments in network infrastructure.

There are, however, many interdependencies between operating expenditures (OPEX) and capital expenditures, and in some cases it is possible to reduce OPEX through capital investments. Investing in better-quality base station equipment and flexible base station subsystem (BSS) features, for example, can give better coverage and reduce the total number of sites. Reducing the base station footprint can help cut site rental costs; more advanced base stations can reduce power consumption[1]; and improved in-service performance can result in fewer site visits.

Transmission flexibility

Most new-growth market subscribers reside in large cities where greater capacity is the primary issue. In rural areas, however, the need is not for capacity but rather for transmission and radio coverage. New network architecture and equipment packages are thus needed to deliver cost-effective coverage quickly. The cost of building a transmission network usually accounts for half of the total network investment. Therefore, it often pays to lease transmission during the first years of operation.

Network complexity

Many operators who are targeting new-growth markets will have to recruit or train personnel to run their networks. Existing operators might already have advanced networks based on dual-band, general packet radio service (GPRS) and service networks that offer a competitive portfolio of services. But they will still need to enhance traffic capacity in urban areas and plan and build out coverage in new regions. To reach the full potential of traffic capacity from existing infrastructure (radio sites and available spectrum), they will need advanced radio features, and they might need help implementing them. Unless operators are able to reuse existing radio sites, the only way forward will be to obtain more spectrum or to increase radio network density by adding more and smaller sites. For many operators, however, these options are not feasible. Instead, they need strong sets of advanced features and built-in system functionality to help guide personnel when planning and running their networks.

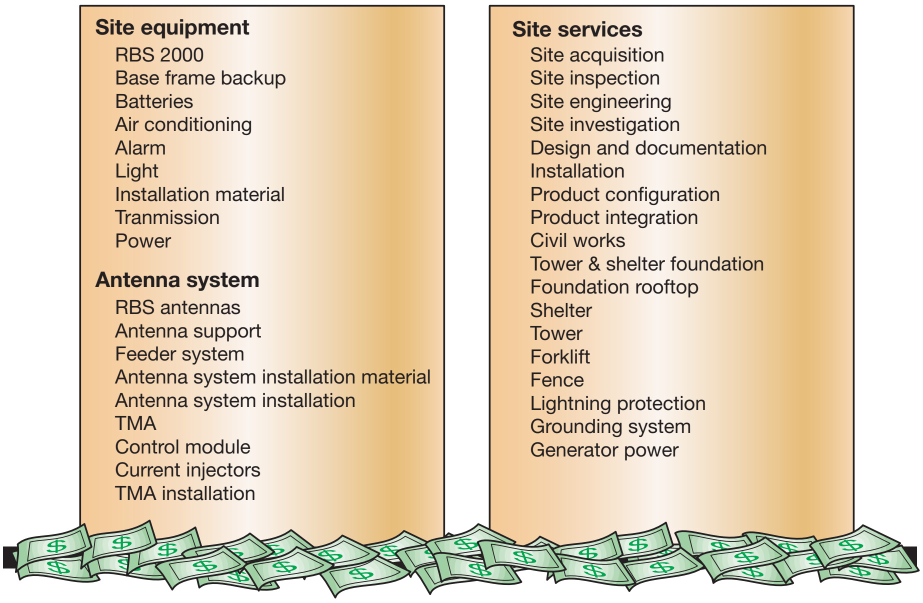

Site equipment
RBS 2000
Base frame backup
Batteries
Air conditioning
Alarm
Light
Installation material
Tranmission
Power
Antenna system
RBS antennas
Antenna support
Feeder system
Antenna system installation material
Antenna system installation
TMA
Control module
Current injectors
TMA installation
Site services
Site acquisition
Site inspection
Site engineering
Site investigation
Design and documentation
Installation
Product configuration
Product integration
Civil works
Tower & shelter foundation
Foundation rooftop
Shelter
Tower
Forklift
Fence
Lightning protection
Grounding system
Generator power

Figure 1
Examples of CAPEX items for an RBS site.

The deployment of traffic in new areas is often related to the placement of radio sites in remote areas. Some sites can only be accessed through many days of hard traveling. Obviously, this is undesirable. Operators thus want to reduce the number of sites needed to provide coverage. They also want more reliable equipment. Finally, they want radio sites that are easy to understand and work on. That way, less technically qualified personnel can, if necessary, be sent to sites to perform simple tasks.

In addition to network expansions, which increase network complexity, wireless data infrastructure will become more important for new-growth markets—in particular because GPRS-based services open the door to significantly lower voice tariffs. Ericsson Instant Talk services, which will enable affordable group voice communication, will likely be as successful in these new markets as short message service (SMS).[2] The infrastructure will be based on GPRS, which heightens the requirements for planning and running wireless end-to-end data services.

Network rollout and tuning

A lack of skilled labor is often a limiting factor when operators want rapid rollout. Notwithstanding, to achieve maximum capacity and coverage on a limited budget, operators must pay careful attention to radio network tuning. By hiring in experienced crews, they can substantially shorten this slow and tedious process.

Advanced radio network functions that facilitate radio network planning and improve network performance are also important parts of the process. For example, four-way receiver diversity greatly increases sensitivity in base station uplinks, thus improving coverage characteristics. Similarly, advanced analysis and reporting functions available via the operations support system—radio and core (OSS-RC) present network information in a format that is easily understood by operation and maintenance (O&M) staff.

Radio site solutions

Standard site configurations are often used to simplify network rollout. The sites can be assembled in a factory environment or on site. In either case, efficient supply flow is needed to deliver all necessary materials on time. Given the cost structure of new-growth markets, the most cost-effective way of building a site generally makes use of local suppliers and certified local subcontractors.

Managed services

Many operators in new-growth markets have limited experience of handling mobile network management and growth. They might therefore benefit from different kinds of managed services. This could be limited to hosting complex nodes—for example, for MMS—but, for good reason, there is a growing trend to outsource entire network operations.

The ultimate outsourcing model—where a supplier delivers capacity as specified by a number of key performance indicators (KPI)—is now taking form in some markets. Here, the network is built out at a pace determined by actual traffic growth. The model addresses financing and competence, and is likely to grow in importance in coming years. It also allows operators to focus on their core business, which is to deliver competitive subscriber services.

Low-cost radio networks for rural coverage

Different solutions for different segments

The main objective of running a telecommunications business is to make money. Consequently, when it comes to service offerings, it frequently pays to stay ahead of local competition. Most markets have more than one mobile operator, and because the majority of users have prepaid subscriptions it is usually quite easy for them to switch operators. New subscribers generally fall into two segments: those who reside in

- urban and suburban areas, where coverage is already in place. The challenge to add more subscribers is often limited by available radio spectrum. The GSM radio networks in this segment are *interference-limited*; and
- rural areas, where traffic demand is unknown because coverage does not currently exist. Operators must thus take commercial risk, investing in infrastructure without knowing when it will pay off. The GSM radio networks in this segment are *coverage-limited*.

The radio features of Ericsson's advanced base station subsystem (BSS) offer a solution for the former segment—that is, the segment with interference-limited systems. Getting more traffic into limited radio spectrum requires sophisticated functions enabled by a rich portfolio of advanced radio features and solutions that allow more carriers (transceivers, TRX) to be inserted into radio networks without jeopardizing the perceived radio quality.

Available solutions for gaining more capacity through cell-, network-, and channel-capacity solutions were described in Ericsson's GSM RAN capacity solutions.[3] Ericsson leads the industry when it comes to solutions for optimizing the use of capacity in existing spectrum.

Smaller cities, villages, and sparsely populated areas make up the rural-area segment, which requires efficient radio solutions with a minimum of radio base station (RBS) sites. A common fallacy is that to minimize the risk of business investments in rural areas, operators should only consider low-priced equipment.

Cost structure of the RAN

Network equipment typically accounts for the largest share of capital expenditures. About 50 to 80% of a mobile operator's capital expenditures is related to networks. For most operators, radio access takes the lion's share of the infrastructure budget. The cost structure of the radio access network (RAN) is usually divided into

- CAPEX, which covers all costs related to initial investments; and
- OPEX, which covers the annual cost of running the network.

The CAPEX for a typical RBS site consists of many elements. The costs associated with an RBS are just part of the total cost that an operator must pay for a new site installation (Figure 1). The price of RBS equipment is only a fraction of the total site cost. But many operators do not readily see that in addition to equipment they will have to pay for services and work carried out by their own organizations or outside help.

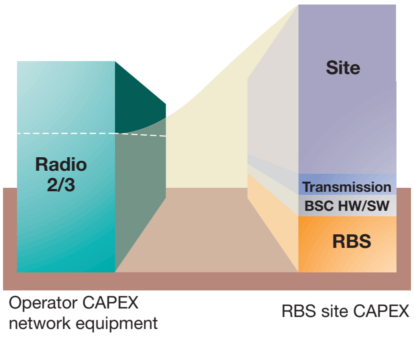


Figure 2
Cost structure for operator's infrastructures.

Local market conditions affect the actual price of site materials and services. When considering the total cost of infrastructure investments, most expenditures relate to radio network infrastructure. Breaking this down in greater detail, we see that the actual cost of the RBS is only about one-third of the total investment in infrastructure—indeed, most expenditures relate to site materials and services (Figure 2).

Operating expenditures are another large financial item that covers all the costs of operating RBS sites in networks. Many costs are easy to forecast because they are based on givens such as set prices for energy and power, transmission, and site rental. Operating expenditures also include maintenance costs relating to

- manual intervention at sites (for example, replacing batteries, adjusting air condi-

tioners, and eliminating transmission failures); and
- unplanned site visits to correct faulty equipment—this expense is hard to nail down because visits can involve salaried employees, travel time, and equipment (car rental and spare parts).

It goes without saying that better, more reliable RBS equipment reduces these costs.

Fulfilling customer demands for lower OPEX

Ericsson knows that its customers want more robust RBS equipment. Therefore, it has developed the second generation of the RBS 2000 family. In doing so, Ericsson reduced the number of replaceable units by 50% while maintaining reliability per unit. These enhancements were made possible thanks to a new hardware platform that facilitates greater integration. The most important element in this new platform is the double transceiver unit (dTRU) that is a transceiver unit which contains two complete GSM transceivers.

Reliability measurements

The most advanced unit inside an RBS is the transceiver. It contains
- powerful amplifiers for transmitting strong radio signals;
- sophisticated processing capability for radio reception; and
- advanced features for handling traffic.

Using a high degree of integration, Ericsson has been able to maintain the same level of reliability from its dTRU as from the previous TRU (with one TRX).

The main objective of the design was to improve the reliability of RBS configurations. To determine how the number of units affects the service levels (reliability) of a large population, Ericsson compared the reliability of systems built with different types of units with the same MTBF value. Figure 3 compares two TRXs in a replaceable dTRU and one TRX in a replaceable dTRU.

Most operators have several RBS installations in their network. Assuming that every reported fault on the radio must be treated immediately, it is easy to see the advantages of having more reliable products in the field. Figure 4 illustrates the potential savings of using more robust radio equipment for medium-sized configurations.

The best ways of achieving cost-effective deployment of a radio network are to reduce the number of required sites and to invest in RBSs that require less maintenance. In some situations it might be beneficial to employ low-capacity RBS solutions, for example, where the terrain prevents the deployment of large radio cells or where the demand for capacity is low and is not expected to change in the near future. Through its Expander program, Ericsson has introduced new capabilities for existing RBS models and new RBS models that better meet operator deployment strategies. The same hardware platform has been used in each model. To the operator, this translates into reduced OPEX (more reliable RBS equipment) and reduced CAPEX (fewer sites and fewer spare parts).

Solutions for fewer RBS sites

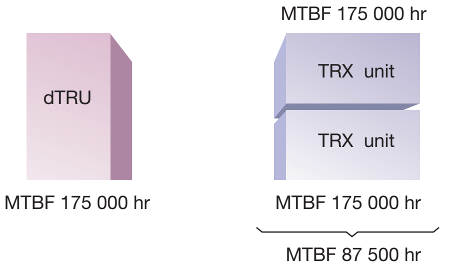
The best route for deploying RBSs in new areas where traffic demand is unknown is to deploy thin but continuous radio coverage via high-performance radio. With two TRXs in each dTRU, the new architecture of the RBS 2000 facilitates additional enhancements to radio performance. Note: When planning a radio network that uses dTRUs, operators should consider the RBS
- downlink capabilities—for reaching the phone; and
- uplink capabilities—for receiving weak signals from the phone.

Three downlink enablers

The dTRU contains two TRXs and an internal hybrid combiner that combines the transmitter signals from the TRXs. The TRXs thus share a common outlet that is fed to the combiner and antenna system. This solution supports four TRXs per antenna.

Figure 3
MTBF reduction when number of units is increased.

Probability that a unit is working, P: $P = \exp(-t/\mathrm{MTBF})$
Number of potential faults, N: $N = \text{no. of units} \times (1-P)$
Compare same functionality: radio part for two TRX



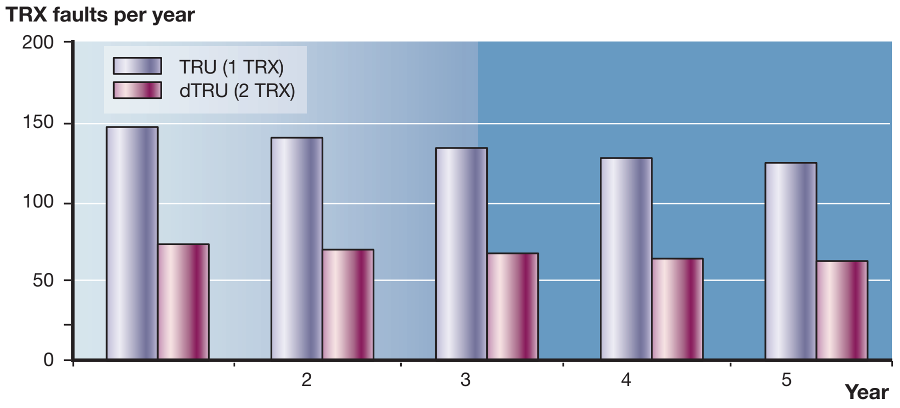


Figure 4
Reliable hardware reduces the number of site visits. This example reflects an installed base of 500 RBSs with six TRXs in each cabinet.

If greater output power is preferred—for example, to provide greater coverage—each TRX can instead be connected directly to the combining and distribution unit (CDU) for connection to the antenna system. This limits the number of TRXs that can be installed in a cabinet, due to the fixed number of inlets to the CDU (if the internal hybrid in the dTRU is not used, only one TRX can be used per CDU inlet). This solution provides greater output power and enables operators to build larger cell areas, which cuts down on the number of RBS sites needed to cover a specific region.

Transmitter coherent combining (TCC) is a software solution that improves the downlink. The solution combines intelligent use of phase adjustment with the internal hybrid combiner (Figure 5). When the dTRU runs in TCC mode, it continues to operate in its normal environment—that is, it does not generate extra heat that might affect the reliability of the dTRU or other equipment in the cabinet.

The three downlink enablers mentioned above use the same equipment or dTRU. The only significant difference is the way in which the transmitter (TX) cables are attached when the internal hybrid combiner in the dTRU is not used. Ericsson also offers a fourth option (available since 1997) for enhancing the downlink. The software power boost function supports downlink transmitter diversity (the mobile phone combines the best of two signals) by transmitting the same information on two TRXs with a short delay and different antennas. Compared with TCC, transmit diversity has

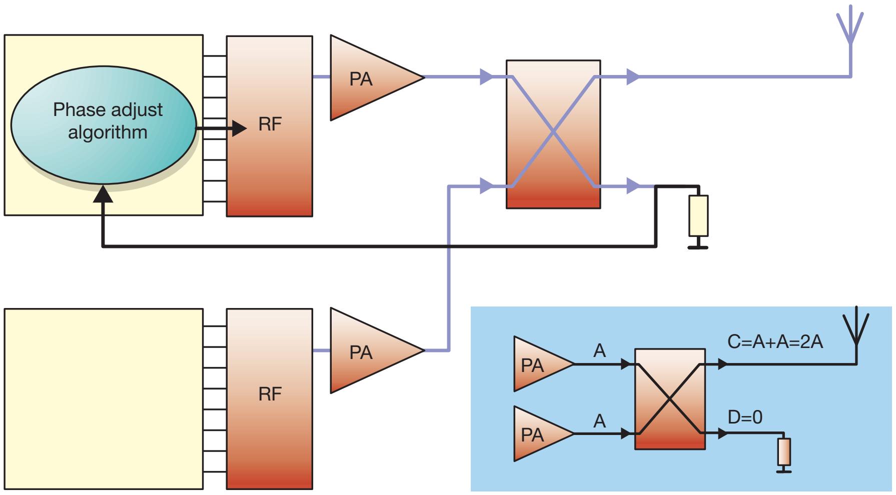


Figure 5
The TCC concept.

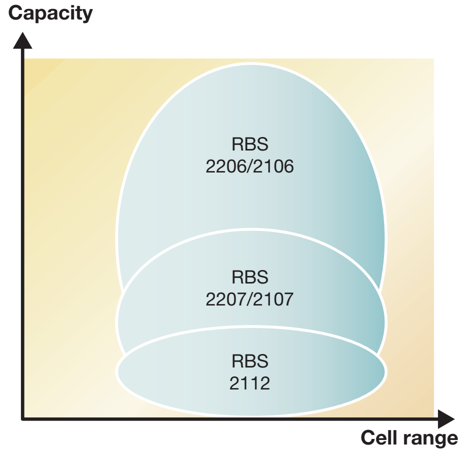


Figure 6
Macro RBS enhancements to meet operator requirements for investing in low-traffic areas. New radio capabilities (TCC, 4-RX diversity, and smart range configurations) reduce the number of radio sites. Likewise, the addition of new outdoor RBS products—RBS 2107 (6 TRXs) and RBS 2112 (2 TRXs)— gives operators greater flexibility.

some negative implications when the mobile phone must decode eight phase shift keying (8-PSK) modulation for EDGE. Likewise, terrain-dependent conditions reduce the certainty of cell coverage.

In summary, in terms of coverage and greater data throughput with EDGE, TCC is preferred over transmit diversity for enhancing the downlink. Box B and Figure 6 summarize the recommended options that make use of the latest hardware platform.

One other important factor to consider when planning a balanced system is the uplink. The uplink capability is more difficult to measure and verify. This is because the measurement requires sophisticated testing that can only be carried out in laboratory environments.

Ericsson's new hardware platform offers some significant improvements in signal reception from mobile phones—for example, improved control over the receiver path in the chain from antenna to extracted signal.

Besides improved receiver path, operators benefit from additional power for processing a more advanced diversity algorithm—given the availability of the new algorithm and platform, Ericsson recommends that operators use a greater value for diversity gain. Operators may also use all four RX branches in one dTRU to improve the uplink from a single source—this is called four-branch diversity. Regular two-branch diversity can yield an additional 4 to 5 dB in gain. By comparison, depending on how the antennas are arranged, four-branch diversity can yield an additional 7 to 9 dB in gain.

Ericsson provides values for normal network conditions and guarantees the values for radio channels that represent real conditions. Different dynamic channels, or faded channels, are used to communicate real performance values. If static values are to be used, the values can be enhanced by an additional 1-2 dB. Ericsson wants to provide operators with accurate values that can be used when planning radio networks. This is why Ericsson provides dynamic, fading-model values.

Good receiver capability cannot be underestimated. At present, many handsets are designed to have the lowest possible output power. This results in longer standby time, which is an attractive feature to end-users. Notwithstanding, it puts even greater demands on the uplink—for reaching a balanced-link budget and guaranteeing coverage in the radio cell. To achieve good radio quality, which is a prerequisite for offering good subscriber services, operators would thus be wise to consider the mobile phone population in their networks. Figure 8 summarizes the different uplink enablers.

The dTRU is very flexible and can be used for several purposes (Figure 9). Its two TRXs, for instance, can be used separately or, by combining Ericsson's unique TCC to improve the downlink and four-way diversity to improve the uplink, they can be configured to create a "super TRX".

Flexible configurations

The downlink- and uplink-enabler solutions can be combined in the same cabinet to offer very attractive combinations of solutions for broad coverage (strong downlink) and high capacity (many TRXs per cell). Ericsson's RBS 2206 (indoor) and RBS 2106 (outdoor) cabinets contain six dTRUs per cabinet.

Having the same equipment in different versions of the RBS gives operators greater flexibility in finding and applying the most

BOX B, COVERAGE ENABLERS

DOWNLINK ENABLERS
Same dTRU can be used in different configurations

Combined mode (internal hybrid in dTRU)	42.0 dBm
Uncombined mode	45.5 dBm
Transmitter coherent combining (TCC)	48.0 dBm

Transmitter diversity (software power boost, SWPB)
Not recommended for extending cell range due to environmental dependencies at cell border
EDGE (8-PSK) performs worse with TX diversity than with TCC

UPLINK ENABLERS

Receiver sensitivity without TMA	-111.0 dBm
Receiver sensitivity with TMA (+compensation for feeder loss)	-111.5 dBm
Two-branch RX-diversity, urban/suburban	4.5 dB
Two-branch RX-diversity, rural	3.5 dB
Four-branch RX-diversity	7-9 dB

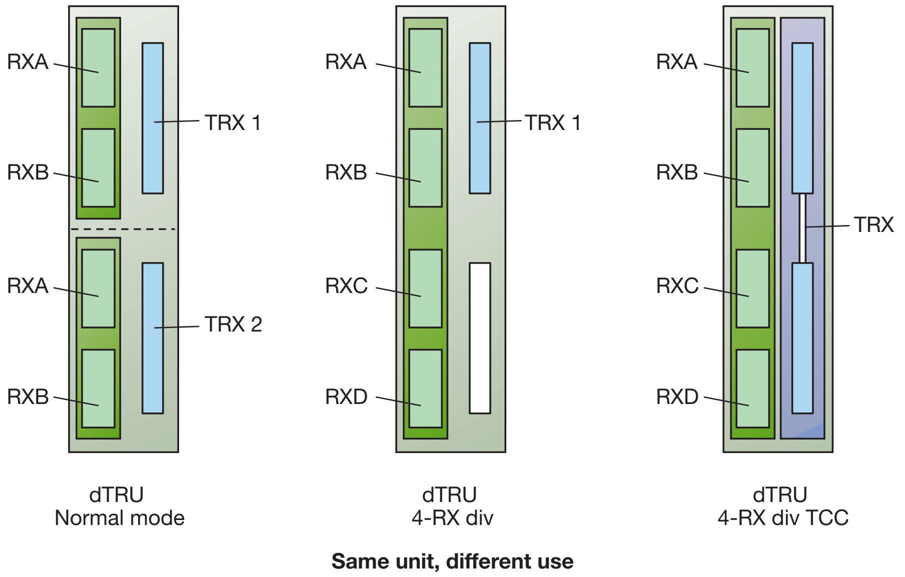

RXA
RXB
RXA
RXB
TRX 1
TRX 2
dTRU
Normal mode
RXA
RXB
RXC
RXD
TRX 1
dTRU
4-RX div
RXA
RXB
RXC
RXD
TRX
dTRU
4-RX div TCC
Same unit, different use

Figure 7
One dTRU can easily be used to extend coverage.

appropriate configuration. For example, a common configuration might have four TRXs per cell (4+4+4 configuration). Six dTRUs are configured using the internal hybrid in the dTRU. The configuration is also called *capacity mode*, because emphasis is on providing as many TRXs as possible per antenna.

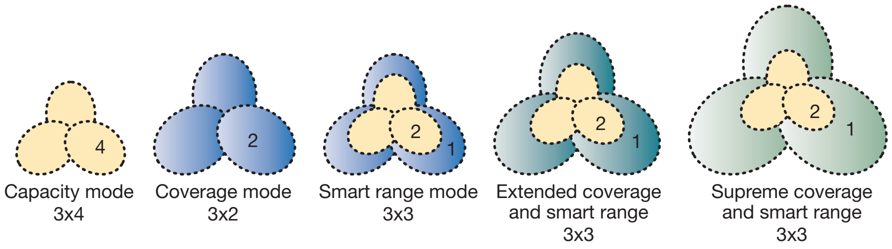
One other configuration, 2+2+2 or *coverage mode*, yields greater output power by not using the internal hybrid in the dTRU. The CDU inlet solely permits three dTRUs to be inserted in the cabinet.

By combining dTRUs configured both with and without the internal combiner, operators can obtain a combined capacity mode and coverage mode configuration in the same cell. This configuration retains the coverage provided by high-output-power TRXs and adds extra capacity by using two additional TRXs with lower output power. A traffic-steering feature manages the differences in the cell range by moving end-users to the smaller overlay subcell when appropriate. This frees up capacity in the larger underlay subcell, which, in turn, yields a total of three TRXs per cell. What is more, the 3+3+3 configuration fits in one RBS cabinet. This approach of combining different output power in the same cell is called the *smart range configuration*.

By boosting the cell range of the underlay subcell, operators can also share the combination of larger subcells (greater coverage) and smaller subcells (greater capacity) with other mechanisms for enhancing coverage. They can also use TCC and run one dTRU as a more powerful TRX. In this case, the same set of cabling is used as for the capacity-mode configuration. The capability is activated with a software command from the BSS. Because the downlink has been extended, this solution gives greater coverage—*extended coverage mode*—than the coverage-mode configuration.

Even better coverage can be obtained when the dTRU is run in combination with the TCC concept and advanced, four-branch-receiver diversity in the uplink. This combination is called *supreme coverage mode*, because the combination offers outstanding radio coverage performance. Figure 11 summarizes the configurations that can be provided in one cabinet.

Figure 8
Example of flexibility provided by the RBS 2x06.


4
Capacity mode
3x4
2
Coverage mode
3x2
2
1
Smart range mode
3x3
2
1
Extended coverage
and smart range
3x3
2
1
Supreme coverage
and smart range
3x3

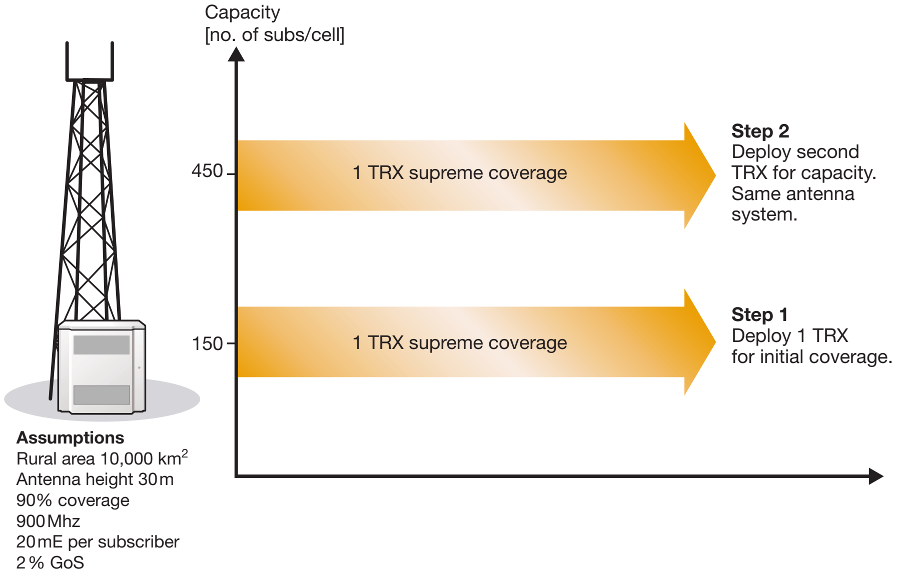

Capacity
[no. of subs/cell]
450
150
1 TRX supreme coverage
1 TRX supreme coverage
Step 2
Deploy second
TRX for capacity.
Same antenna
system.
Step 1
Deploy 1 TRX
for initial coverage.
Assumptions
Rural area 10,000 km²
Antenna height 30 m
90% coverage
900 Mhz
20 mE per subscriber
2 % GoS

Figure 9
Initial deployment with one TRX per cell and expanded to two TRXs per cell.

Entry-level solution with potential for greater capacity

Below follows a scenario in which an operator begins deploying large, limited-capacity cells. Later, when traffic increases, more capacity can be added. The sequence (Steps 1-4, Figures 9-11) shows how an initial, extreme-coverage site is expanded to yield ten times as much capacity per cell through the addition of TRX hardware and BSS software features. By employing different configurations of the same set of RBS equipment, Ericsson can help operators to continually optimize their radio networks using a minimum of sites. If conditions are right, large areas can be covered using a single RBS.

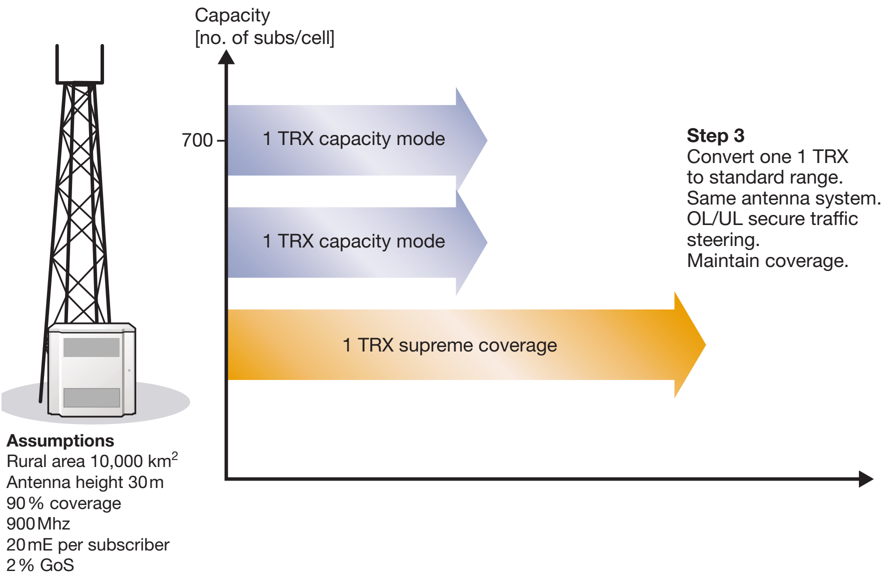
Step 1

Ericsson's unique dTRU can be configured as a single TRX with double output power. This reduces the initial investment while providing maximum coverage from a minimum of sites. The solution can be further enhanced with four-RX diversity in the uplink.

Step 2

Capacity is enhanced by inserting an additional dTRU per cell—doing so almost triples the capacity for serving regular subscribers. The antenna and feeder system need not be upgraded (Figure 9).

Figure 10
Third stage of capacity expansion.


Capacity
[no. of subs/cell]
700
1 TRX capacity mode
1 TRX capacity mode
1 TRX supreme coverage
Step 3
Convert one 1 TRX
to standard range.
Same antenna system.
OL/UL secure traffic
steering.
Maintain coverage.
Assumptions
Rural area 10,000 km²
Antenna height 30 m
90 % coverage
900 Mhz
20 mE per subscriber
2 % GoS

Step 3

Capacity can be further enhanced without a visit to the site: from the operations center, the second dTRU is put into the capacity-mode configuration, making three TRXs available per cell. Capacity is now up to five times that of the initial configuration. Additional BSS features—dynamic overload (OL) and underload (UL)—are also introduced to secure traffic routing between two subcells with different coverage (Figure 10).

Step 4

Once again, capacity can be increased without a visit to the site. After completing this step, capacity will be 10 times that of the initial configuration. Ericsson's unique, load-based, dynamic half-rate function allocates traffic channels at operator-defined thresholds. The function enables two users to share a single available radio channel in the same cell. If necessary—for instance, during peak hours—every connection might make use of the half-rate function (Figure 11).

When traffic demand skyrockets, operators can either add

- macro RBS capacity, by deploying additional RBS cabinets at each site and synchronizing them with existing cabinets; or
- micro RBS capacity to offload cells, by introducing micro cells in macro cells.

When this decision comes, however, it will be based on steady traffic demands in the region. That is, the operator is no longer faced with having to invest in a region with unknown traffic volumes. All subsequent expansion with new RBS cabinets will thus be based on healthy traffic scenarios. This means it is fairly easy to calculate when the investment will pay off.

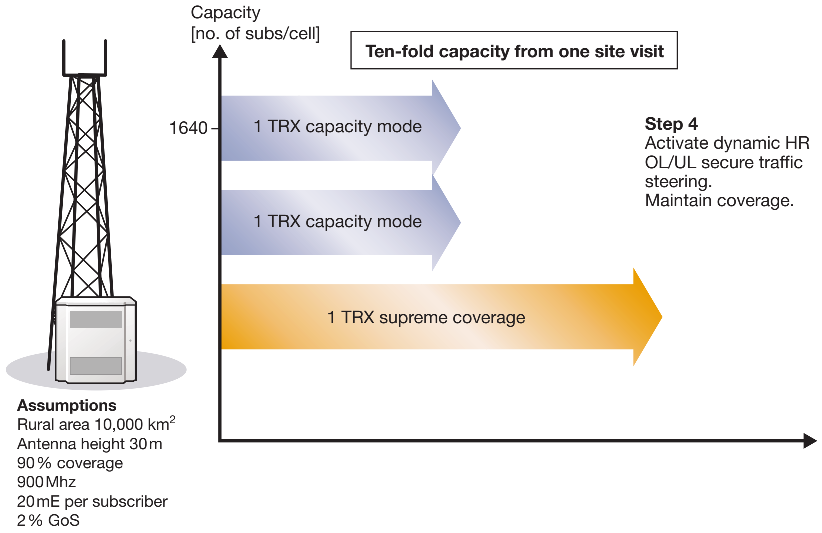


Figure 11
Stage four: Ten-fold capacity per cell in the same RBS cabinet and from the same antenna system.

Conclusion

As-yet untapped new-growth markets offer significant opportunities for growth and expansion provided they are addressed properly. Competition and price pressure in these markets are fierce, marketing costs and churn rates are high, and initially, there will be little demand for value-added services. Typical characteristics of these markets are a low-income subscriber base, limited financing for new technology, and competition-eroding margins. Operator inexperience is also an issue in some areas. Notwithstanding, knowing that new subscriber growth will primarily come from these markets, Ericsson is giving its highest priority to all related requirements.

Ericsson's GSM Expander program, for example, has been developed with these unique requirements in mind. In short, it helps operators to address the challenges of new-growth markets by

- limiting entry-level investments;
- providing flexible and scalable capacity;
- minimizing the total cost of ownership; and
- protecting investments through high-quality technology platforms.

The solutions are reliable and open-ended, which means no compromises are made in performance or quality. Initially, operators might opt to offer a limited amount of services, capacity and functionality, but they are free to expand them later without costly re-engineering.

Ericsson's leadership in the wireless industry maximizes operator business advantages today and provides a secure route toward future capabilities. The Ericsson Expander offering yields different capacity solutions from the same equipment—this lowers operator investment risks, because an RBS and all its parts, for example, are the same regardless of whether they are deployed in urban or suburban areas with heavy traffic or in sparsely populated areas where traffic loads are unknown.

In markets with a large population of prepaid subscribers, competitive operators need to offer the best services in the region. Ericsson's solutions extend cell range without jeopardizing system reliability. No external boosters are needed to improve downlink capability, because operators use the equipment in normal operation mode. This yields better reliability and helps operators to reduce the number of site visits.

To lower business risks, operators need to know that returns on current investments will extend far into the future. Ericsson's large-coverage solution provides a very flexible way of adding capacity as traffic demands increase. This article describes how operators who deploy an RBS site to obtain initial coverage can later boost capacity tenfold through one visit to the site to insert a second dTRU.

Small-capacity macro RBSs are also available as a complement to the portfolio.

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Expander—Cost-effective expansion into new geographical areas

Stephen Carson, Bodil Josefsson, Anette Lundvall, Michael Martinsson, Niclas Melin and Joerg Sieber

Ericsson has developed a set of solutions that help operators address opportunities in high-growth markets by reducing their total cost of ownership. The solutions encompass everything from the core network and radio access network, to transmission, charging systems and services. Ericsson Expander consists of cost-effective solutions that provide coverage-optimized technology for GSM/EDGE and CDMA2000 networks. The article *GSM network solutions for new-growth markets*, published in Ericsson Review no. 1, 2004, explained Ericsson's Expander solutions for GSM.

In this article, the authors present a case study that illustrates the potential of Ericsson's Expander solutions in the GSM radio access network. They also describe how operators may obtain cost-effective coverage by utilizing different parts of the Expander offering throughout the network.

Using TCO to highlight Expander solutions for the GSM radio access network

Total cost of ownership

The article *GSM network solutions for new-growth markets* laid the groundwork for understanding how Ericsson's Expander radio solutions can help network operators to lower their operating and capital expenditures.[1] This article applies the concepts introduced in that article to a specific case—in a recent study completed for a large African mobile operator, Ericsson demonstrated that it makes economic sense to invest in advanced radio solutions to lower the cost of expanding coverage. Using a progression of five scenarios, Ericsson calculated the total cost of ownership (TCO, a benchmark of the cost of expanding coverage in a defined area) for the radio access network. The study showed that the operator could significantly reduce its cost of operating the network.

The TCO of a GSM radio access network is the sum of costs associated with dimensioning the access network, including operating expenses (OPEX) and depreciation. The TCO model is not a business case because it does not include revenues or the costs of business operations. Instead, it concentrates on annual network expenses calculated for specific coverage and capacity.

Ericsson developed the TCO model to evaluate the impact that decisions to deploy base stations (including all site equipment and costs, transmission, BSCs, and related software) have on network OPEX and depreciation (Figure 1). The model includes the following costs:

- GSM radio access equipment (BTS hardware, BSC hardware and BSS software);
- additional BTS site equipment (shelters, towers, antenna systems, air conditioning, sets of power generators);
- civil works;
- network roll-out;
- operations and maintenance (O&M);
- power;
- site rental;
- transmission (terrestrial microwave between BTS and BSC); and
- vendor expenses (spares, support, training).

TCO model for the GSM RAN

The TCO model makes general assumptions about the area to be covered. These include population, penetration, expected traffic intensity, percentage half-rate traffic, dedicated resources for data traffic, and so on. This data is input into a cell-planning tool (TEMS) to dimension suitable cell layout and BTS configurations. Next, costs are estimated. All capital expenditures (CAPEX) are then converted to depreciation and added to OPEX to yield total cost of ownership—TCO.

Highlights of the study

In the study for the African GSM operator, Ericsson estimated the annual TCO for a prospective expansion in a region where the operator is currently building out its network. Using a progression of five scenarios

BOX A, TERMS AND ABBREVIATIONS

3G	Third-generation mobile communication
AMR	Adaptive multirate
ARPU	Average revenue per user
ATM	Asynchronous transfer mode
BSC	Base station controller
BSS	Base station subsystem
BTS	Base transceiver station
CAPEX	Capital expenditure
CDMA	Code-division multiple access
CGSN	Combined GGSN and SGSN
CS	Circuit-switched
EDGE	Enhanced data rates for global evolution
EFR	Enhanced full rate
GGSN	Gateway GSN
GPRS	General packet radio service
GSM	Global system for mobile communication
GSN	GPRS service node
IP	Internet protocol
IVR	Interactive voice response system
MCPA	Multi-carrier power amplifier
MGW	Media gateway
M-MGW	Mobile MGW
MSC	Mobile switching center
MSC-S	MSC server
NMT	Nordic mobile telephone
O&M	Operation and maintenance
OPEX	Operating expense
PLMN	Public land mobile network
PSTN	Public switched telephone network
RAN	Radio access network
RBS	Radio base station
SGSN	Serving GSN
TCO	Total cost of ownership
TDM	Time-division multiplexing
TMA	Tower-mounted amplifier
TrFO/TFO	Transcoder-free operation/tandem-free operation
TRU	Transceiver unit
USSD	Unstructured supplementary services data

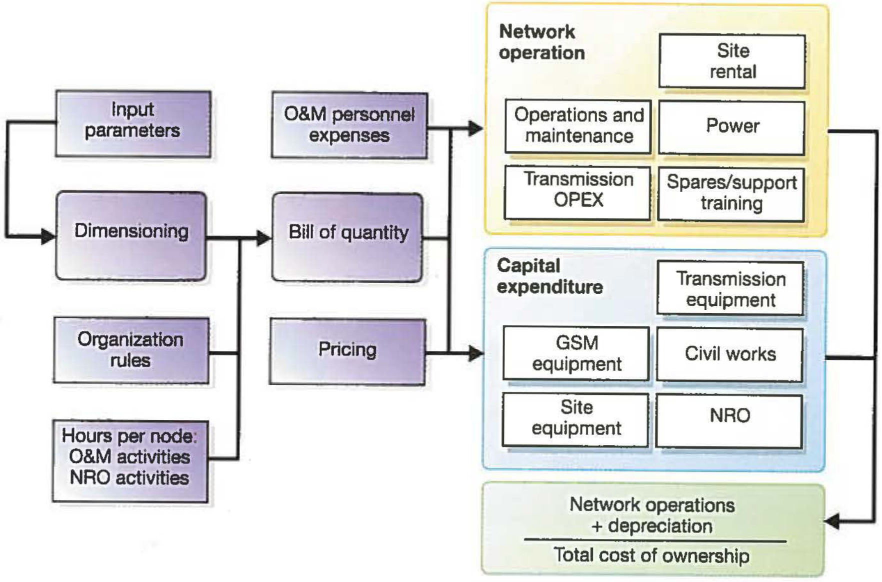

Input parameters
Dimensioning
Organization rules
Hours per node:
O&M activities
NRO activities
O&M personnel expenses
Bill of quantity
Pricing
Network operation
Site rental
Operations and maintenance
Power
Transmission OPEX
Spares/support training
Capital expenditure
Transmission equipment
GSM equipment
Civil works
Site equipment
NRO
Network operations
+ depreciation
Total cost of ownership

Figure 1
Logical diagram of the TCO model.

(Figure 2), Ericsson first demonstrated the positive impact of reducing the number of sites using its Expander radio solutions. The focus of each subsequent scenario was on reducing cost per site.

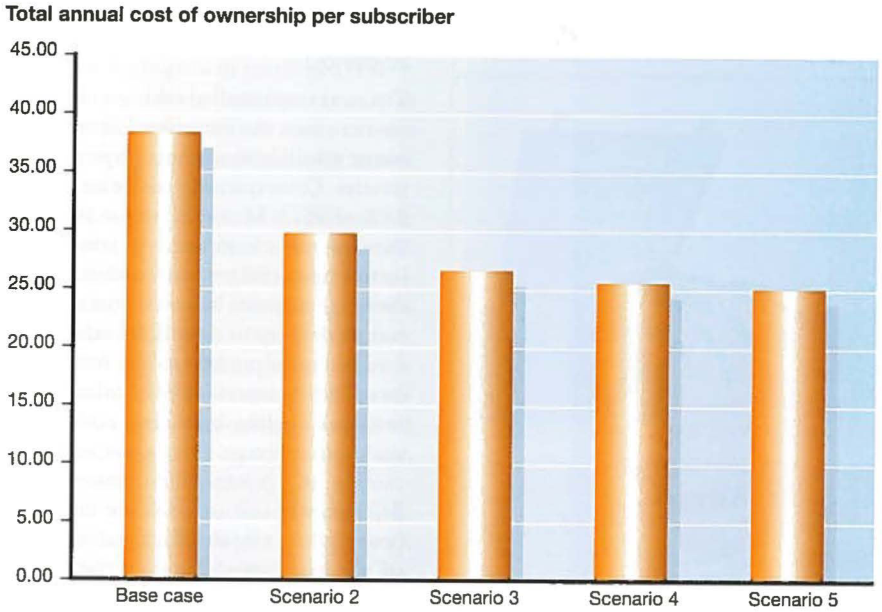
Scenario 1, "Base case"

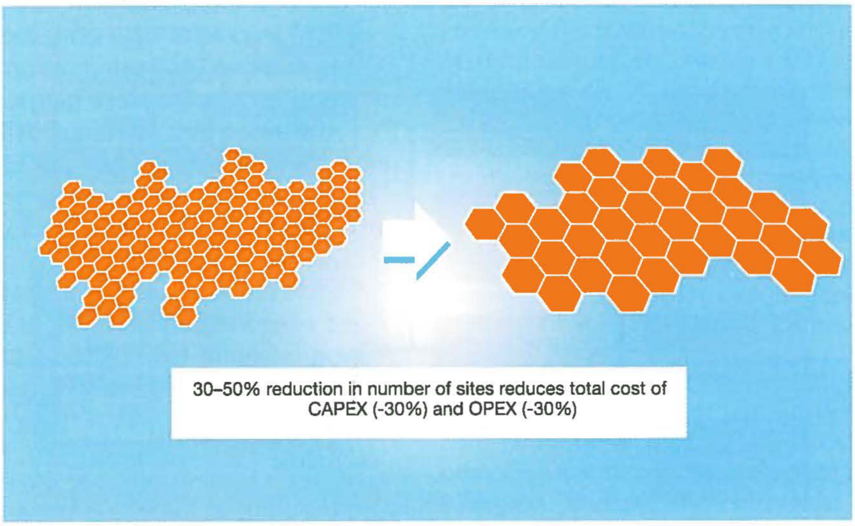
Ericsson collected the operator's costs for O&M personnel, power, RBS site rental, transmission, support agreements, site security, civil works, and so on. From the outset, it was known that power would be a major issue: in fact, the operator estimated that half the BTS sites in the new coverage area would not have access to regular electrical power. This meant that the operator would have to invest in twin sets of diesel generators and arrange for the delivery of vast amounts of diesel oil.

Given the general assumptions listed above and the link budget data for the radio configurations, Ericsson planned the cell layout for the region. Note that Ericsson did not use its Expander solutions for this initial layout. In this particular case, it was determined that a "traditional" layout to meet coverage and capacity demands at the specified requirements for signal strength would require 53 sites.

Next, using output from the TEMS cell-planning tool, Ericsson put the site configurations into the TCO model to calculate annual TCO per subscriber (depreciation plus network OPEX): the outcome was slightly more than USD 38.

Figure 2
Five scenarios for reducing TCO (depreciation + network operations expense).




30–50% reduction in number of sites reduces total cost of CAPEX (-30%) and OPEX (-30%)

Figur 3
The network view—fewer sites means lower total cost of ownership (TCO).

Scenario 2

Keeping capacity constant, Ericsson re-planned the cells using its Expander solutions, which make use of transmitter coherent combining, four-way receiver diversity, SmartRange, tower-mounted antennas (TMA) and so on. As can be expected, this significantly affected the grid for the radio access network by

- decreasing the number of sites from 53 to 41;
- increasing coverage; and
- improving quality.

The reduction in sites translates into a 22% reduction in annual TCO of the radio access network per subscriber (Figure 3).

Scenario 3

The next step entailed taking a close look at on-site costs. As mentioned above, the operator would have to generate power for half its sites. Consequently, power accounted for 28% of TCO. Moreover, it was learned that the operator's standard site configuration, including container, air conditioning, and diesel generators, was dimensioned to accommodate up to three RBS cabinets. This configuration put an unduly heavy burden on operating costs—in particular, for an operator expanding into new, untested areas with thin coverage. By re-dimensioning site cooling and power-generation equipment, Ericsson was able to lower the annual TCO per subscriber by an additional 8% (or 30% off the base case). Changing the configuration, however, would leave the operator with less flexibility (fewer options for subsequent expansion).

Scenario 4

By deploying RBS 2106 outdoor cabinets with heat exchangers instead of RBS 2206s with shelters and air conditioning, Ericsson could further reduce the annual TCO per subscriber by an additional 3% (33% cumulative reduction from the base case) and restore the operator's ability to expand the site beyond a single cabinet. In many instances, the higher price of outdoor cabinets has served as a barrier to sales, but TCO shows that this a false economy. That is, operators who opt for outdoor cabinets gain both in terms of

- CAPEX—the higher price of the cabinets is offset by savings in air conditioning equipment and shelters; and
- OPEX—eco-cooling solutions consume less power and require less maintenance than traditional solutions.

Scenario 5

Finally, Ericsson explored the use of an alternative source of energy—bio-diesel. Calculations showed that this option would lower fuel and operating costs further, resulting in an additional 2% savings, or 35% cumulative reduction from the base case in annual TCO per subscriber. Bio-diesel, which is refined from locally produced vegetable oils, offers substantial economic and ecological advantages:

- at least 20% lower price per delivered liter;

- lower maintenance requirements for the diesel generators; and
- less pollution.

Summary and conclusions

TCO is the sum of network OPEX and network-related depreciation. Using the concept as a benchmark for the cost of expanding the radio access network, Ericsson showed that it has a method for evaluating the economic impact of different solutions. Ericsson then introduced the concept on a step-by-step basis beginning with advanced radio solutions to reduce the number of BTS sites needed for a defined coverage and capacity, and then by reducing CAPEX and OPEX per site.

By applying these methods to the African operator's prospective expansion, Ericsson demonstrated a 35% reduction in the projected annual TCO for the RAN per subscriber as follows:

- 22% reduction using Expander radio solutions; and
- 13% reduction through more efficient site dimensioning, the introduction of the 2106 outdoor BTS cabinet, and the use of bio-diesel.

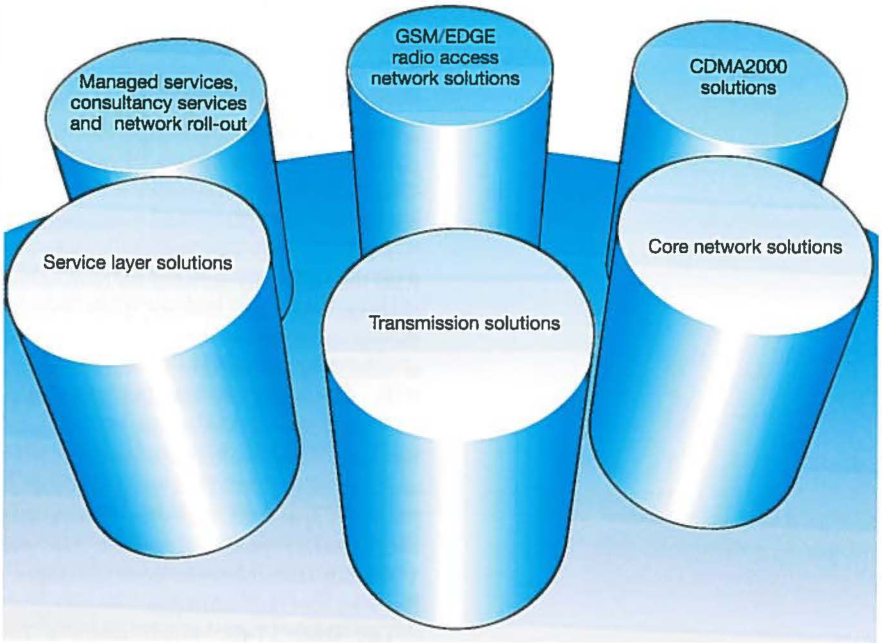

Managed services, consultancy services and network roll-out
GSM/EDGE radio access network solutions
CDMA2000 solutions
Service layer solutions
Core network solutions
Transmission solutions

Figure 4
Ericsson Expander solutions.

Expander characteristics

Expander is both a concept and a set of mobile solutions for the core network, radio access network, service layer, and transmission and telecommunications services (Figure 4). It includes tailored-to-fit business and technology consultancy services to help operators develop business cases and design networks with optimum quality and performance.

Serving new users profitably should not mean compromising on quality. But to obtain the lowest TCO, operators must take advantage of advanced features. Ericsson's Expander solutions and functionality are taken from the company's high-tech portfolio (Figure 5), which was designed to reduce operator TCO by

- optimizing entry-level investments;
- ensuring flexible growth in capacity, as needed;
- reducing maintenance requirements; and
- protecting investments through proven, future-proof technology platforms.

GSM/EDGE Expander RAN

New capabilities included in Ericsson's GSM/EDGE Expander RAN solution use Ericsson's most recent technology platform (the double TRU) to extend cell coverage and reduce the number of radio sites. For a more detailed description of the solutions for GSM/EDGE RAN, please read *GSM network solutions for new-growth markets.*

CDMA2000 Expander

Ericsson's CDMA2000 Expander solution addresses changing market needs, giving operators in high-growth markets a cost-effective way of scaling from low capacity to heavy network traffic. Several new products have been developed specifically for operators in these markets.

All of Ericsson's CDMA2000 products are based on the company's third-generation mobile communication (3G) platforms—that is, the hardware and software have been designed specifically to meet 3G requirements and to accommodate future technology migration. What is more, Ericsson's CDMA2000 products are easy to scale and have the best footprint-to-performance ratio in the industry.

The use of common platforms, which span across different technologies and network nodes within each technology, greatly increases product reliability. It also means that

Figure 5
Expander, a part of Ericsson's complete portfolio.

ERICSSON
Product portfolio
Expander Solutions

operators can reduce their inventories of spares and cut training costs.

Base stations fit for CDMA2000 Expander

Ericsson's CDMA2000 Expander product portfolio is extremely versatile and offers the ideal solution for operators with requirements for low capacity and wide coverage.

The RBS 1143, a single-carrier, omni-cell RBS that is highly suitable for remote rural coverage with low capacity, gives operators the option to deploy RBSs in rural hot-spots at a fraction of the cost of a fully sectorized RBS. And being the smallest of Ericsson's RBS products, it is very easy to deploy—it has been designed for outdoor deployment and can be mounted on walls, rooftops, or poles. When used together with a 20W single-carrier power amplifier, the RBS 1143 can transmit over great distances in flat-area coverage scenarios.

The RBS 1140, which offers a two-carrier, omni-cell configuration, provides adequate scalability for operators who require small to medium capacity. Like its little brother, the RBS 1140 is ideal for rural hot-spot coverage. And by having two carriers instead of one, it gives operators slightly more capacity. Operators who pair it with a 60W multi-carrier power amplifier (MCPA) have considerable flexibility in building out

- extremely high-coverage, low-capacity networks; or
- medium-capacity, medium-coverage networks.

Ericsson has designed its Macro RBSs—RBS 1130 and RBS 1131—for operators who need to scale to high-capacity networks. However, when configured as one- or two-carrier base stations, these products can also serve as the main building blocks in a very cost-effective, small-footprint solution for low-capacity CDMA2000 networks. Like the RBS 1140, the indoor RBS 1130 and outdoor RBS 1131 feature MCPAs that enable them to blast a signal with up to 60W per carrier, resulting in low-capacity cells with a large area of coverage. In addition, the RBS 1130 has been designed to support operators with spectrum in the 450MHz frequency band. In this spectrum, the RBS 1130 supports three-carrier, three-sector configurations with MCPA technology.

Fewer base stations

MCPAs and TMAs make up a cornerstone of Ericsson's CDMA2000 Expander offering. MCPAs enable operators to adjust the power output of any given RBS to up to 55W per channel; TMAs enhance the ability of RBSs to receive weak signals. When used in combination, MCPA and TMA technology can increase the cell radius by up to 22% (Figure 6). This increase has the potential to reduce the number of RBSs needed for a network by up to 33%. For operators of low-capacity networks this translates directly into reduced CAPEX.

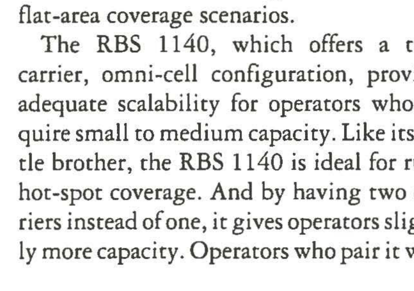
Ericsson offers 60W MCPAs for deployment with the RBS 1130, RBS 1131 and RBS 1140. Operators may choose

- to use full output power (55W) on one carrier;
- to increase the reach of the cell;
- to distribute the cell across several carriers, at a minimum of 20W power output per carrier; or
- to increase capacity by decreasing the reach of the cell.

CDMA450 Expander technology

Government agencies in many countries see CDMA2000 in the 450MHz frequency band as a cost-effective alternative to higher frequency build-outs and are opening up this spectrum for use in remote areas and rural networks.

Figure 6
The combined benefits of MCPA and TMA technology.


Forward-link enhancement
Flexible MCPA allowing up to 60W per carrier
Reverse-link enhancement
Tower mounted amplifier (TMA) providing improved overall RX sensitivity
Extented coverage
3dB link budget gain
22% larger cell radius*
50% larger cell area
33% fewer sites

* assuming a path loss of 35 log(D)

Thanks to better propagation, products operating in the 450MHz frequency band can cover rural areas at a fraction of the cost of networks operating at higher frequencies. For example, a base station operating in the 450MHz frequency band effectively covers

- 100% more area than the same base station operating at 800MHz; and
- 500% more area than the same base station operating at 2.1GHz.

Rural operators can thus significantly reduce their capital and operating expenditures. The solution is of particular interest to NMT450 operators who want to continue using the 450MHz spectrum, and to operators in countries where CDMA450 technology is being considered for either rural or fixed wireless access (FWA) coverage.

Core network

Ericsson's mobile core network includes several solutions that specifically address TCO (Figure 7). Special focus is put on layered architecture—a network design that physically and logically separates sub-networks that are responsible for

- service management and control (control layer); and
- transport of service data (connectivity layer).

This design is essential for optimizing costs and achieving excellent service quality. The primary building blocks of the layered architecture are the MSC server (MSC-S) in the control layer and the mobile media gateway (M-MGW) in the connectivity layer. The MSC-S handles all network signaling and intelligence for setting up, releasing and monitoring circuit-switched (CS) calls. The M-MGW processes and manages the transport of circuit-switched voice traffic and interconnections to external networks, such as the PSTN, other PLMNs, and international telecommunications networks. The MSC-S (signaling traffic) and the M-MGW (payload traffic) each flexibly handle TDM, ATM and IP transport technologies.

The layered architecture supports a distributed switching system that concentrates call control and processing to a limited number of central locations. M-MGWs can be distributed to remote sites (that is, they can be co-located with each BSC) to enable local traffic switching. Because at least 60% of all calls typically originate and are terminated within a given local area, this approach yields maximum transmission efficiency.

For non-locally switched traffic, the layered architecture supports efficient packet

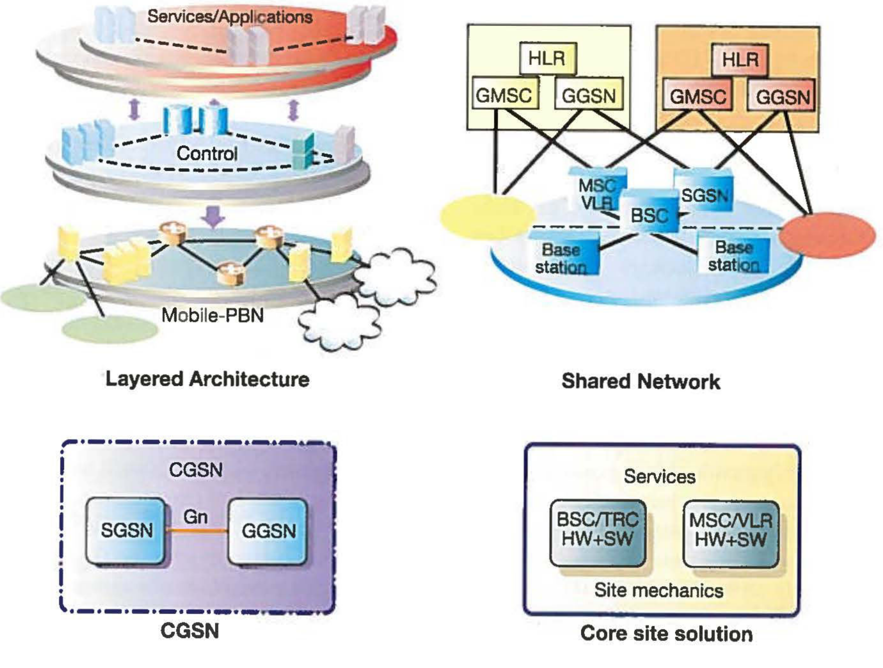


Figure 7
Expander solution—building blocks of the mobile core network.

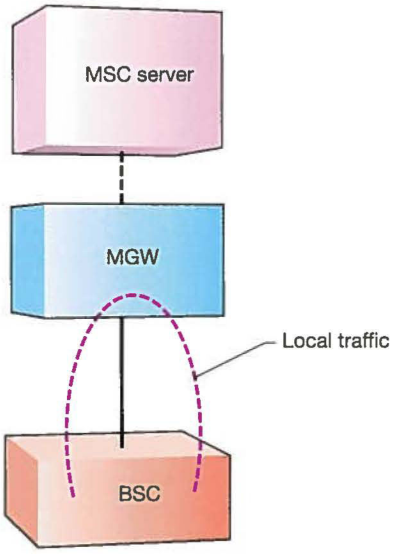


Figure 8
Thanks to the layered architecture, operators can expand into new areas with a cost-effective core network. Benefits include
- **huge reductions in transmission costs—the case study showed that nearly 60% of all traffic can be handled with local switching; coded voice in the backbone network can reduce bandwidth requirements by nearly 80%;**
- **centralized sites and specialist resources; and**
- **independent evolution of each network layer.**

backbone technology (ATM or IP) and features that reduce the amount of bandwidth needed to transport voice traffic across the network. Features in the core network, such as transcoder-free operation/tandem-free operation (TrFO/TFO) interworking, preserve the voice coding (EFR, AMR) used in the radio network, which improves bandwidth efficiency 300-600% and reduces the cost of the transport infrastructure.

The layered architecture also facilitates the establishment of highly centralized control facilities at key network operations centers. Operators may thus benefit from a rationalization of switching sites, more efficient network operations with fewer centers and heads, more efficient use of network infrastructure, and massive reductions in floor space and power requirements.

The layered architecture gives operators with core network operations the most cost-effective means of expanding the core network into new geographic areas (Figure 8). By separating the execution and control functions from payload transport, they can expand into the new service area using only compact and cost-effective M-MGWs. The M-MGWs can transport payload in the new area. The core network can manage the service and control parts using existing MSCs both as traditional MSCs and as MSC-Ss.

Ericsson has developed the CGSN for cost-effective introduction of packet-data (GPRS) services in new areas. This is a unique entry-level solution that combines SGSN and GGSN functionality in a single physical node. The CGSN may later be used as a stand-alone SGSN to facilitate smooth migration to a split GPRS core network.

Ericsson's Shared Network solution permits operators to share network infrastructure in order to lower their initial investments and operating expenses. There are two applications for the mobile core network: the Common Shared Network and the Geographically Split Network. In either instance, to preserve differentiation, operators keep their individual home and service networks. They may also complement the shared network with independent areas of coverage.

Ericsson's Core Site solution, which consists of highly standardized, pre-tested site-level solutions, such as pre-configured MSCs and BSCs, facilitates rapid deployment and efficient use of operator resources. Several traditionally on-site activities are now performed in a controlled environment in the factory. The solutions are delivered to the site with operator software already loaded and tested.

Transmission

Roll-out speed, flexibility and reduced cost associated with microwave backhaul networks represent an important step toward cost-effective build-out of coverage and profitable service delivery at a lower level of average revenue per user (ARPU). Today, six of ten GSM RBSs are connected through point-to-point and point-to-multipoint microwave links. Ericsson's MINI-LINK microwave systems provide excellent scalability and reliability, helping guarantee minimum transmission OPEX (Figure 9). To further reduce the cost of site infrastructure, the transmission unit can be integrated, verified and shipped as part of the RBS. This has positive impact on design, ordering, installation and operations thanks to simplification and improved network quality.

Acquiring or gaining access to land to lay copper or fibre networks—especially over long distances—can be a lengthy and costly process. Requirements for microwave backhaul networks, on the other hand, are minimal. With microwave, access is solely required at the hub and remote sites, not in between. Also, high reliability and remote configuration are especially advantageous where backhaul networks cover large, sparsely populated areas and where site access is restricted by physical barriers (mountains, valleys) or weather. Once installed, modern microwave backhaul networks are virtually maintenance-free, which translates into few repairs and site visits, and reduced need for built-in redundancy. An important consideration in this context is that the microwave infrastructure which carries mobile traffic can also be used for broadband access, thereby facilitating the build-out of rural broadband.

New, "smart" microwave aggregation nodes have gone a long way toward reducing the complexity of backhaul aggregation. Ericsson's innovative "smart" node concept combines microwave radio links with digital cross-connect capability and optional SDH multiplexers—all in one scalable platform. Compared with traditional solutions, operator experience of the integrated smart node concept shows huge savings in CAPEX and OPEX. Operators who use these smart nodes together with an effective network management system can manage all backhaul network traffic from one central loca-

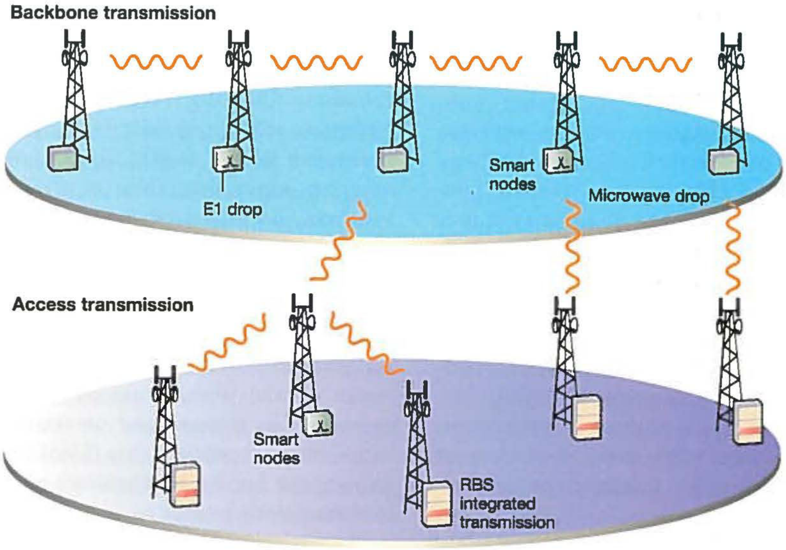

Backbone transmission
Smart nodes
E1 drop
Microwave drop
Access transmission
Smart nodes
RBS integrated transmission

Figure 9
Cost-effective transmission solutions for backbone and access.

tion with a only few clicks of a mouse. Ericsson also offers a scalable range of digital cross-connect nodes, which when used in combination with the MINI-LINK portfolio, form a complete end-to-end solution to any transmission requirement from the smallest node to the largest optical cross-connect.

When controlled by centralized software, the backhaul network can be used to its full potential. End-to-end traffic management translates into fewer site visits for installation, capacity upgrades, and (re)configuration. The core transmission network can be built with distributed switching (local switching), lowering the capacity on interregional transmission links.

Satellite transmission is an alternative over very long distances and when bandwidth requirements are small. Ericsson's transmission solutions include bandwidth

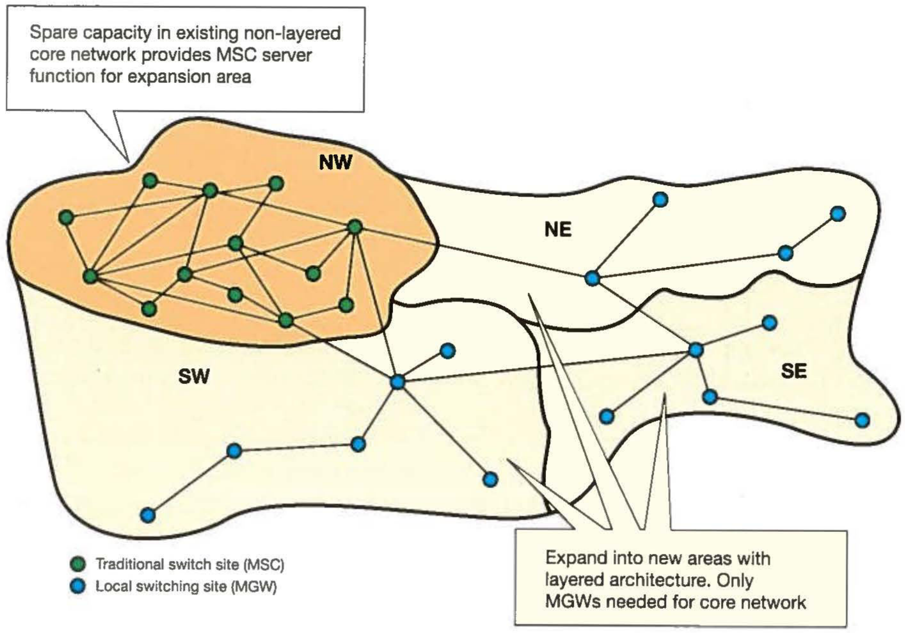

Spare capacity in existing non-layered core network provides MSC server function for expansion area
NW
NE
SW
SE
● Traditional switch site (MSC)
● Local switching site (MGW)
Expand into new areas with layered architecture. Only MGWs needed for core network

Figure 10
Ericsson Expander is a powerful concept for bringing coverage to users in rural and remote areas.

compression techniques that reduce the cost of satellite transmission.

Charging solutions

Ericsson's convergent charging solutions, which are based on the Charging System, support real-time charging of pre-paid and post-paid subscriptions. This eliminates the need for a separate billing system and improves financial risk management, which leads to significantly reduced cost of ownership.

The Charging System better enables operators to acquire customers, increase customer loyalty, and increase revenues:

- operators can, in real-time, reward users with money or free usage (depending on how much traffic an account has generated);
- operators can, in real-time, confirm prices or notify users about rewards to stimulate usage and increase loyalty;
- operators can allow subscribers to communicate with families and friends at discounted prices; and
- operators can provide international roaming for voice, data and content services.

Ericsson's Charging System allows subscribers to refill pre-paid subscriptions via alternative refill channels whose commissions are lower than those of traditional vouchers. Examples of alternative refill channels include distributor-operated over-the-air refill, web or ATM refill, and automatic bank withdrawals when the balance reaches zero. Customers can check their account balance in practically any language via the Web, interactive voice response (IVR) systems and unconstructed supplementary services data (USSD). This reduces the burden on customer care and lowers operating costs.

The Charging System also improves operator revenues by providing real-time charging and session supervision—that is, before granting a session, it checks the user account and reserves funds for the request-ed services. This prevents users from exceeding credit limits.

Services

In addition to technical solutions, Ericsson's Expander solution also contains a variety of services. Ericsson's business consulting services help operators to define applications that target low ARPU users. Ericsson can also assist operators with business decisions and planning.

Likewise, Ericsson can guide operators through the network design process to ensure robustness and capacity.

Ericsson can also provide operator staff with tailored-to-fit training.

Ericsson's installation and integration services draw on its base of global and local resources to ensure streamlined installation of new products, to give operators the shortest time to operation.

The Establish, Operate and Transfer service targets operators who are entering new markets, migrating between technologies, or who face a major expansion (Expander). The service is composed of Network Planning, Design and Performance Optimization, Service & Network Assurance, and Service Provisioning.

Conclusion

Ericsson Expander is a powerful concept for bringing coverage to users in rural and remote areas.

In a recent study completed for a large African mobile operator, Ericsson demonstrated that operators can profitably serve users in these new-growth markets.

Ericsson's Expander portfolio consists of several solutions developed specifically to help operators profitably address users located outside established areas of coverage. Regardless of whether operators have GSM or CDMA2000 networks, they can take advantage of Ericsson Expander.

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Reducing TCO with the new RBS 2x16

Stephen Carson, Christer Friberg, Anders Kilegran and Johan Norrby

Market demands for a more efficient way of building out GSM have given rise to a new model of radio base station in Ericsson's renowned family of RBS 2000 products. RBS 2216 (for indoor deployment) and RBS 2116 (for outdoor deployment) feature a common building practice for combining GSM and WCDMA on the same footprint. The design thus meets operator demands for modernizing radio networks.

Ericsson's objective when designing RBS 2x16 was to bring down the operator costs of establishing and operating radio networks. The authors describe the thinking behind, and outline some of the most important operator benefits of, this new product.

GSM networks still growing strong

The worldwide market for GSM shows significant growth of new subscribers and of total traffic. The latest prognosis indicates that more than three billion people will have a wireless subscription by the end of this decade. The majority of these subscriptions will be based on mainstream GSM and WCDMA access technologies.

These two radio technologies were designed and standardized in such a way that end-users can move between them without experiencing disruptions. The continued evolution of GERAN will enable GSM to provide better service by boosting the speeds of wireless data.[1] And greater service transparency is giving operators a golden opportunity to optimize their investments in terms of network build-out.

For operators with GSM and WCDMA licenses, GSM will provide a significant service for many years to come, creating an efficient combination of support for market segments made up of subscribers attracted to

- ultra-low-cost handsets (GSM); and
- the convenience of mobile broadband enabled by WCDMA/HSPA.

GSM operators without a WCDMA license can stay competitive by providing outstanding service. This requires a modern GSM radio access network (RAN) that makes efficient use of spectrum for voice and wireless data offerings.

Ericsson's GSM macro base stations are prepared to meet future operator demands. The RBS 2000 series of RBSs already includes several different models to accommodate a variety of deployment strategies. RBS 2206 and RBS 2106, for example, are 12-transceiver-per-cabinet versions for indoor and outdoor deployment, and Ericsson's new RBS 2216 and RBS 2116 models, also with 12 transceivers (TRX) per cabinet, have been designed to help operators cut costs through a greater degree of integration. For instance, in a footprint of only $0.24 m^2$, operators can

- deploy a 24-TRX radio base station;
- integrate a 12-TRX radio base station together with a site support cabinet with more than six hours of battery backup; or
- mix 12-TRX GSM with six-carrier WCDMA.

The new RBS 2x16 will co-exist with RBS 2x06, which already enjoys wide deployment. This is because many operators want to continue expanding their networks with products they have already begun using (RBS 2x06). Other operators, however, might find the benefits of RBS 2x16 so significant that they will transition to this line for network modernization or expansions. Ericsson's ambition is to satisfy both demands. Therefore, RBS 2x16 should be regarded as a complement to RBS 2x06 within the RBS 2000 series.

Ericsson thoroughly evaluated operator challenges before setting out to design the new macro radio base station. The objective was to help operators modernize their GSM radio networks and introduce cost-effective solutions for

- providing coverage to new areas;
- providing greater capacity to existing networks; and
- combining GSM with WCDMA at one site.

TCO concept

The essential principle underpinning total cost of ownership (TCO) is to understand every cost associated with making an investment. As the mobile communications industry has matured, vendors have had to move beyond price/performance to address the full implication of deploying equipment. Today, the industry studies how equipment features affect the overall costs of owning and operating equipment.

TCO is useful in the initial stages of evaluating two or more solutions with the same potential to generate revenue – that is, if an operator builds the solution one way, the an-

BOX A, TERMS AND ABBREVIATIONS

4WRD	Four-way receiver diversity
A-bis	Interface between BSC and BTS
BBS	Battery backup system
BSC	Base station controller
BSS	Base station subsystem
CAPEX	Capital expenditure
CDU-G	Combiner distribution unit, version G
CPU	Central processor unit
CXU	Configuration switch unit
DRU	Double radio unit
DSP	Digital signal processor
dTRU	Double transceiver unit
DXU	Distribution and switch unit
EDGE	Enhanced data rates for global evolution
EMC	Electromagnetic compatibility
EUL	Enhanced uplink
GERAN	GSM/EDGE radio access network
GSM	Global system for mobile communication
HSDPA	High-speed downlink packet access
LNA	Low-noise amplifier
RAN	Radio access network
RF	Radio frequency
RX	Receiver
O&M	Operation and maintenance
OPEX	Operating expenses
PA	Power amplifier
RBS	Radio base station
RXS	Receiver splitter
TCC	Transmitter coherent combining
TCO	Total cost of ownership
TMA	Tower-mounted amplifier
TRX	Transceiver
TX	Transmitter
WCDMA	Wideband code-division multiple access

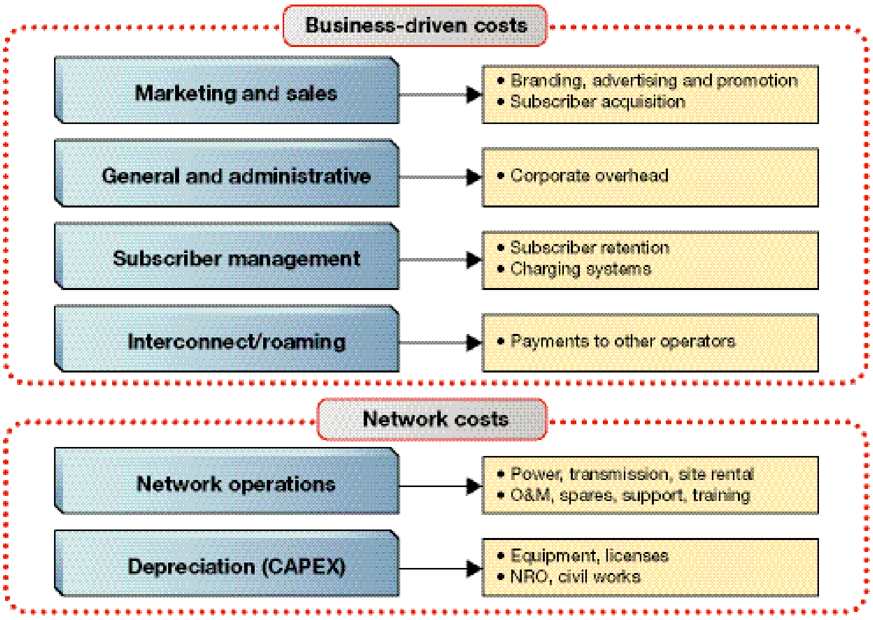

Business-driven costs
Marketing and sales
• Branding, advertising and promotion
• Subscriber acquisition
General and administrative
• Corporate overhead
Subscriber management
• Subscriber retention
• Charging systems
Interconnect/roaming
• Payments to other operators
Network costs
Network operations
• Power, transmission, site rental
• O&M, spares, support, training
Depreciation (CAPEX)
• Equipment, licenses
• NRO, civil works

Figure 1
Mobile operator cost structure.

nual cost structure will be *A*; if he builds it another way, it will be *B*. In either case, the potential revenue is the same. TCO is ideal for analyzing the economics of efficiency-based features and solutions (as opposed to revenue-enhancing features and solutions).

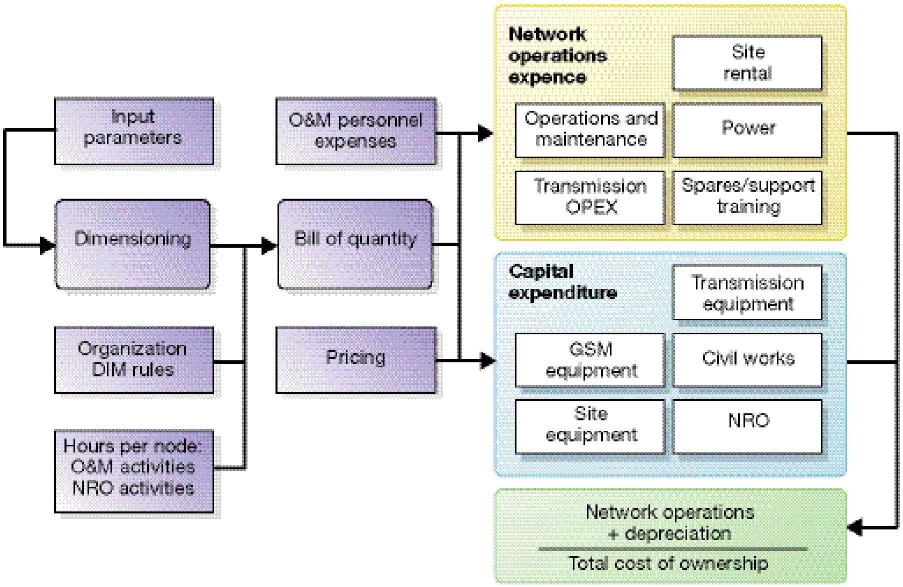
Mobile operator cost structure

To analyze a mobile operator's TCO, one must isolate every cost that is directly related to the network. Moreover, one must distinguish between costs that are driven by the way a business is managed and those cost categories that are directly driven by the way a network is dimensioned and operated.

To make the analysis useful, one must also limit the study of cost drivers to first-order effects. We realize that there are secondary and tertiary effects in play: decisions regarding network build will affect quality, which affects churn, which influences revenues and the costs of acquiring and retaining subscribers.

Figure 1 shows annual costs relative to an operator's income (profit or loss) statement. In order to assess and compare trade-offs between annual operating costs and investment costs, capital expenditures (CAPEX) are converted to depreciation.

Figure 2
Logical diagram of the TCO model.


Input parameters
Dimensioning
Organization DIM rules
Hours per node: O&M activities NRO activities
O&M personnel expenses
Bill of quantity
Pricing
Network operations expence
Site rental
Operations and maintenance
Power
Transmission OPEX
Spares/support training
Capital expenditure
Transmission equipment
GSM equipment
Civil works
Site equipment
NRO
Network operations + depreciation
Total cost of ownership

The operator must then decide how the network can be built to meet demands for capacity and coverage. All costs relative to fulfilling these demands are termed network-driven costs. Using TCO, operators can evaluate various alternatives.

TCO applied to the GSM RAN

TCO, as it relates to the GSM radio access network, is the sum of costs driven by dimensioning the access network, including operating expenses (OPEX) and depreciation. As stated above, the TCO model concentrates on annual network expenses calculated for a given coverage and capacity. Depreciation is calculated from the costs of

- GSM radio access equipment, such as radio base station (RBS) hardware, base station controller (BSC) hardware and base station subsystem (BSS) software;
- additional BTS site equipment (antenna systems, power systems, installation material);
- A-bis transmission equipment (A-bis is the interface between BSC and RBS);
- civil works (construction, towers, air-conditioning, shelters); and
- network rollout.

Network-related OPEX accounts for operations and maintenance (O&M) personnel and overhead, electricity, site rental, A-bis transmission (leased lines), and vendor expenses (spare parts, support, training).

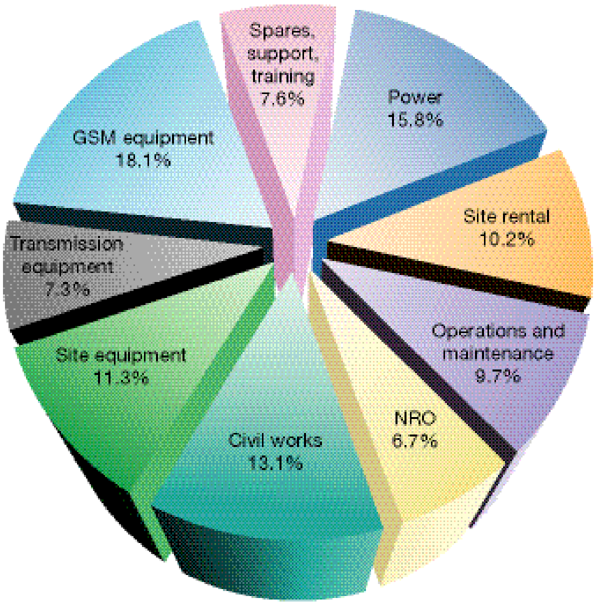


Figure 3
Example TCO study showing the annual cost distribution associated with the radio access network (RAN).

Figure 4
Left: RBS 2216 is a 12-TRX indoor macro RBS for GSM. Center: RBS 3216 is a six-carrier indoor macro RBS for WCDMA. Right: BBS 2216 indoor site support cabinet.

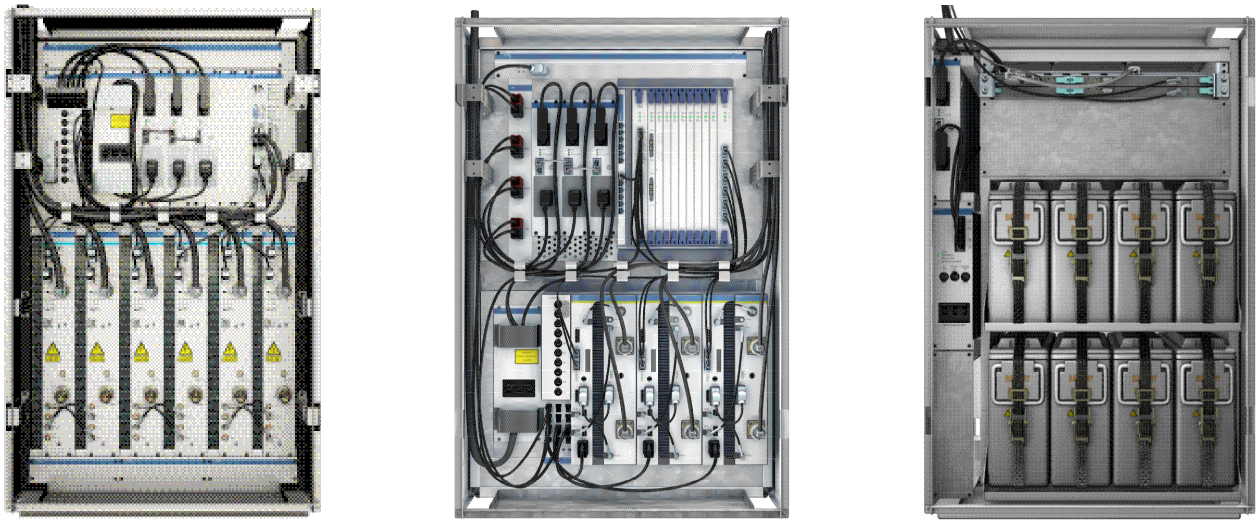
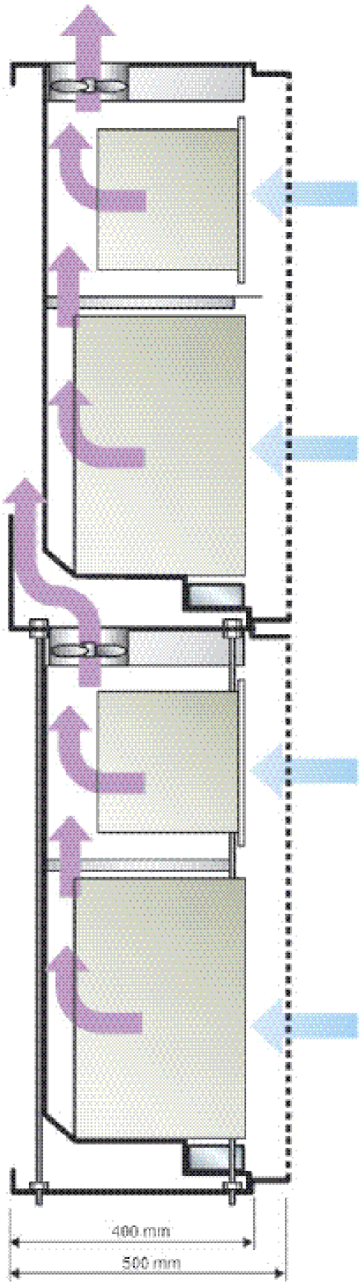


Figure 5
Double-chimney design.



The model

Figure 2 is a logical diagram of the TCO model, which is based on information about coverage area, associated subscriber base, expected traffic intensity, percentage half-rate traffic, dedicated resources for data traffic, radio quality and so on. This input is used in a cell-planning tool (TEMS) to dimension suitable cell layout and BTS configurations. When this is done, an operator can estimate his costs.

To compare the costs of different ways of dimensioning and building the RAN, the model calculates TCO for various scenarios – for example, with and without the products, solutions and features being studied. Figure 3 exemplifies a typical TCO study.

Reducing TCO with RBS 2x16

Armed with an analysis of the total cost of rolling out and operating a radio network, operators can more easily target costs.

Impact of link budget on number of sites

The most straightforward way to keep costs at a minimum is to use as few radio sites as possible to deliver the necessary capacity, coverage and quality. This is because the number of sites has a direct impact on the OPEX and CAPEX of radio networks.

As a member of the RBS 2000 family, RBS 2x16 is positioned to support several radio configurations, including

- those suitable for densely populated areas, where cell range is often determined by available spectrum and capacity demands; and
- a range of configurations optimized for coverage, where terrain and capacity permit far site-to-site reaches.

RBS 2x16 introduces enhanced radio performance compared with RBS 2x06. Improved output power from the transceiver and an enhanced building practice, which removes internal cable losses when the outdoor cabinet is used, boost the link budget by as much as 1.5dB. This improvement means that fewer sites are needed to provide the same coverage. A 1.5dB increase in the link budget translates into a 12% to 23% savings (reduction) in radio sites. The reduction is dependent on choice of coverage mode, site configuration, and terrain model.

Power consumption

Electrical power is needed at radio sites to drive radio base stations and other equipment, such as cooling equipment, transmission equipment, and battery backup systems. A radio site configured with RBS 2x16 consumes significantly less power than its predecessors, primarily because it

- accommodates higher working temperatures with maintained reliability; and
- employs a new cooling concept for outdoor sites.

Below, we compare two scenarios. First, we study indoor solutions, comparing RBS 2216 with RBS 2206. We then look at outdoor solutions, comparing RBS 2116 with RBS 2106.

Indoor comparison

Many indoor deployments contain a cooling or heat-removal component for taking care of heat from the equipment room. Studies show that 0.5kW electrical energy is required (to run air-conditioning equipment) to cool or remove 1kW heat energy (in the equipment room). For our comparison, we have assumed that air conditioning equipment at a site with RBS 2206 must run continuously. By contrast, air conditioning equipment at a site with RBS 2216 needs only run one-fifth of the time. In other words, the introduction of RBS 2216 signifies a 10°C increase in maximum operating temperature. The savings, in terms of power consumption, is more than 25%. If one also reduces the number of sites, thanks to improved link budget, then the potential reduction in total power consumption in the radio network is more than 33%. The actual results are dependent on local climate and site design.

Outdoor comparison

RBS 2116 is available without a heat exchanger, enabling operators to reduce power consumption per site even more than for indoor sites. In addition, enhanced radio performance yields even greater potential to reduce costs compared with RBS 2106. Ericsson estimates that operators who introduce RBS 2116 can reduce power consumption in the network by nearly 40%.

Network rollout and site acquisition

RBS 2x16 has small physical dimensions and is very flexible in terms of on-site installation. Therefore, it has the potential to significantly reduce operator costs. Its small size and flexible design facilitates placement, and an improved link budget gives operators a larger area from which to search for sites. This translates into a greater num-

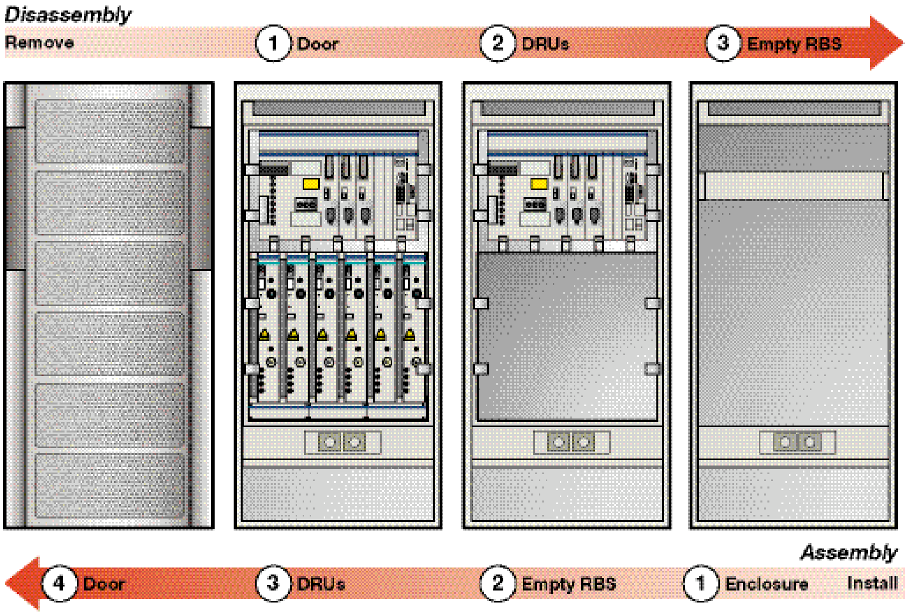


Figure 6
Disassembly/assembly of RBS 2116.

ber of alternative sites, which will drive down site rental costs.

Examples of innovative placement include attics, spaces beneath stairways and other spots with limited headroom. Indeed, one can now place RBS 2x16 next to a BBS to create a complete site that is less than one meter tall.

Ericsson's customers have asked for more flexible ways of installing cabinets on rooftops or in other locations that have traditionally been difficult to access without the use of a crane. RBS 2x16 can be carried to site by hand. Its small size also helps reduce transportation costs during rollout.

In addition, it is now easier to distribute weight at outdoor sites, by separating the radio base station and support cabinets. This eliminates the need for conventional weight-distribution solutions such as girders.

Building practice

Introduction

RBS 2216 is a twelve-transceiver indoor macro radio base station for GSM (Figure 4, left), while RBS 3216 is a six-carrier indoor macro radio base station for WCDMA (Figure 4, center) based on the R3 architecture.[2] BBS 2216 is an indoor site support cabinet that contains battery backup support for up to two radio base stations (GSM and/or WCDMA). It also supports transmission equipment (Figure 4, right).

RBS 2216, RBS 3216 and BBS 2216 (indoor versions) are each 90cm in height (excluding base frame). They have the same footprint (60cm x 40cm) as RBS 2206 and RBS 2202. The units can be mounted side-to-side, back-to-back, or with back or side to the wall.

The outdoor versions, called RBS 2116, RBS 3116 and BBS 2116, use the same outdoor enclosure. RBS 2116 and RBS 3116 also use the same cooling system.

Stacking

The RBS 2216, RBS 3216 and BBS 2216 cabinets can be stacked on top of one another, which results in very compact and flexible indoor site installations. The height of two stacked cabinets, excluding the base frame, is 180cm, which matches that of a single RBS 2206. Examples of sites in a stacked configuration include a

- 24-TRX GSM radio base station;
- 12-TRX GSM radio base station and site support unit; or
- 12-TRX GSM radio base station and six-carrier WCDMA radio base station.

The compact building practice is especially useful in modernization and change-out scenarios. The performance of the new equipment matches or betters that of the equipment it replaces while occupying less space.

Indoor cabinet cooling

Stacked indoor radio base stations require special cooling arrangements. The design of RBS 2216 incorporates a dual-chimney system: Air enters the unit from the front, flowing over the equipment and taking up heat. The air is then channeled into the inner chimney. Fans at the top of the unit suck the hot air into the chimney. The exhaust from the lower unit is routed to the outer chimney in the upper unit. Stacked radio base stations are thus cooled independently of one another (Figure 5).

Outdoor cabinet cooling

RBS 2116 employs an open cooling system that uses filtered outdoor air to cool it. Open cooling system designs must take humidity, pollution and corrosive gases into consideration.

Ericsson has designed RBS 2x16 to handle rough conditions. It has no back planes and few internal cables. Each unit is sealed so that circuit boards are not exposed to airflow. Extra tight sealing is used on units that dissipate significant amounts of heat. In addition, every unit fulfills requirements for electromagnetic compatibility (EMC).

Relative humidity inside the radio base station is minimized and controlled by keeping the inside temperature higher than the outside temperature. When temperatures are very high, the difference between

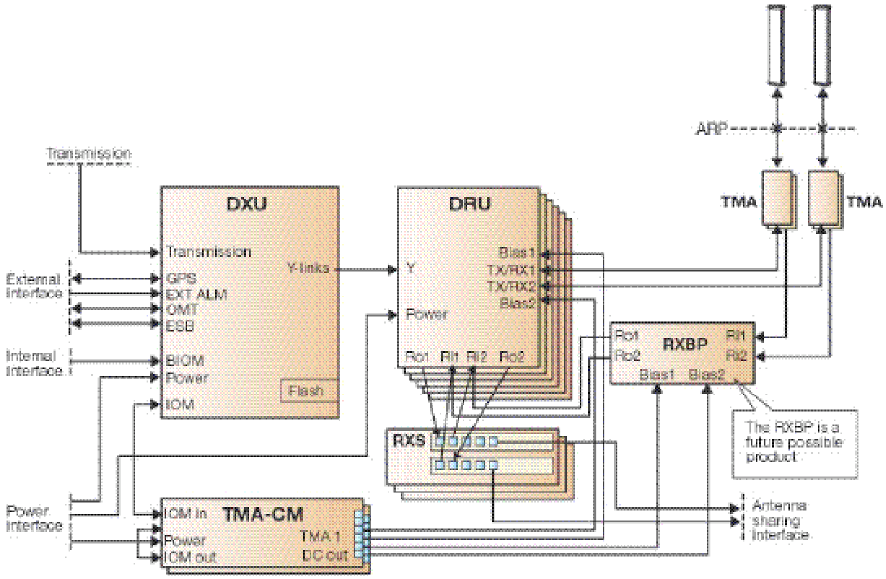

Transmission
External interface
Internal interface
Power interface
DXU
Transmission
Y-links
GPS
EXT ALM
OMT
ESB
BIOM
Power
IOM
Flash
DRU
Y
Power
Bias1
TX/RX1
TX/RX2
Bias2
Ro1
Ri1
Ri2
Ro2
ARP
TMA
TMA
RXBP
Ro1
Ro2
Ri1
Ri2
Bias1
Bias2
The RXBP is a future possible product
RXS
Antenna sharing interface
TMA-CM
IOM in
Power
IOM out
TMA 1
DC out

Figure 7
Architecture of the radio domain system.

indoor and outdoor temperatures is only marginal – climate measurements taken around the world show that relative humidity is low at very high temperatures. When temperatures are low, the external airflow is reduced. When temperatures are very low, the external airflow is shut off altogether. Instead, air is circulated inside the radio base station. If necessary, a heater is activated.

Carry to site

RBS 2106, which comes as one unit, pre-equipped and tested, with radio base station, battery backup, and transmission equipment, is an excellent solution where cranes can be used to install outdoor sites.

A common practice in large European cities is to situate radio base stations on rooftops. It is sometimes difficult, however, to obtain approval to use cranes for these installations. Moreover, in many new, fast-growing GSM markets, one cannot count on crane availability during network rollout. What is more, widespread use of poles and associated power and telephone lines make it difficult to work with cranes at some sites. Ericsson has thus built an outdoor radio base station that can be installed on site without a crane. It can be disassembled into parts and carried by hand – the heaviest part of RBS 2116, for example, weighs only 70kg. And the dimensions of the largest unit (the enclosure without door) are just 65x65x130cm. Easy disassembly and reassembly shortens installation time (Figure 6). RBS 2116 can be disassembled and reassembled in less than 30 minutes. It can be disassembled into four major parts: an outdoor enclosure, the empty radio base station, double radio units (DRU), and the door. A cable supervision feature helps site integrators to verify that cables have been connected properly. Ericsson's carry-to-site concept also applies to BBS 2116 and RBS 3116.

Cable supervision feature

At startup, the RBS 2000 system automatically checks connectivity over internal control interfaces. This check detects whether a control cable is missing or has been misconnected. In addition, RBS 2x16 automatically checks that the receiver (RX) jumpers between DRUs are properly connected between ports.

Shared antenna systems

As with other GSM and WCDMA radio base stations from Ericsson, RBS 2x16 (GSM) and RBS 3x16 (WCDMA) can share antenna systems.[3]

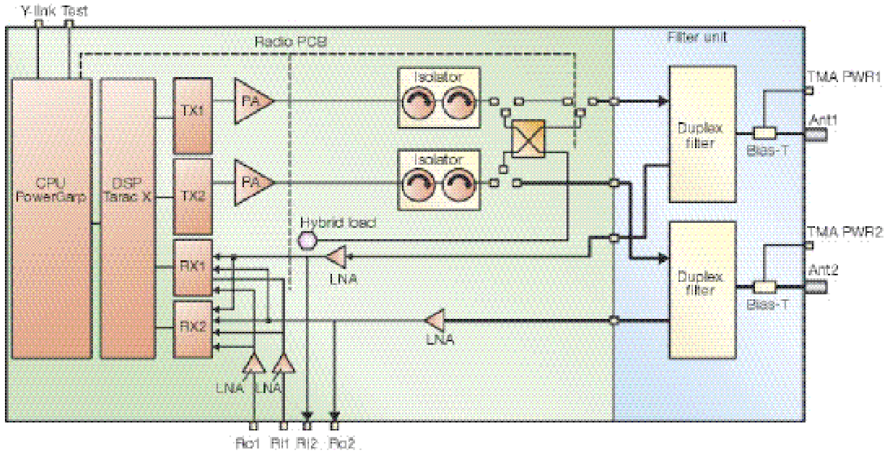
Architecture

New member of the RBS 2000 family

The units in RBS 2x16 are new, but they originate from RBS 2000 system architecture. All central functionality is executed on a distribution and switch unit (DXU); functionality for two GSM carriers (2 TRX) is executed on a DRU. A Y-link is used between the DXU and DRUs. Six DRUs (12 TRX) can be connected to one DXU.

The same chipset (ASIC) is used in the DXU and DRUs. Likewise, the same interfaces are used between ASICs to ensure that the functionality of RBS 2x16 and RBS 2x06 can evolve together.

Figure 8
Block diagram of the double radio unit (DRU).


Y-link Test
Radio PCB
Filter unit
CPU PowerGarp
DSP Tarac X
TX1
TX2
RX1
RX2
PA
PA
Isolator
Isolator
Hybrid load
LNA
LNA
LNA
LNA
Duplex filter
Duplex filter
TMA PWR1
Ant1
Bias-T
TMA PWR2
Ant2
Bias-T
Ro1
Ri1
Ri2
Ro2

All RBS 2000 products, including RBS 2x16, are supported by single-track software. Therefore to introduce new functionality (for example, to increase transmission, baseband and radio functionality), operators need only implement software once for all RBS 2000 products. Figure 7 describes the system architecture of the radio domain.

DRU

DRU architecture

Hardware integration is a requirement for building compact radio base stations. In RBS 2x16, Ericsson has integrated the double transceiver function (dTRU in RBS 2x06) with cavity duplex filter functionality (CDU-G in RBS 2x06) and receiver RF distribution functionality (CXU in RBS 2x06) to yield a DRU. Due to its small physical size, RBS 2x16 does not support filter combining. Figure 8 shows the DRU block diagram. The CPU system controls the DRU. A DSP cluster processes baseband signals for the uplink and downlink, and controls radio functions for two GSM TRXs. Digital data is passed to and from the TX/RX radio parts. Two low-level TX blocks convert the signals to GSM band. Two power amplifier (PA) blocks amplify the signals to the required power level. A hybrid combiner combines two TX signals to one antenna port (the combiner is bypassed in uncombined mode). A duplex filter combines or splits TX and RX in an antenna connector. An RX distributor network – which consists of low-noise amplifiers (LNA), step attenuators, splitters, two RX inputs and two RX outputs – supports a wide range of radio configurations via a common DRU. Two radio receivers (with receive diversity) convert RF to baseband data. The DRU has built-in support for TMA, which eliminates the need for external Bias-T. Some radio configurations require an additional external splitter located in a splitter unit (RXS).

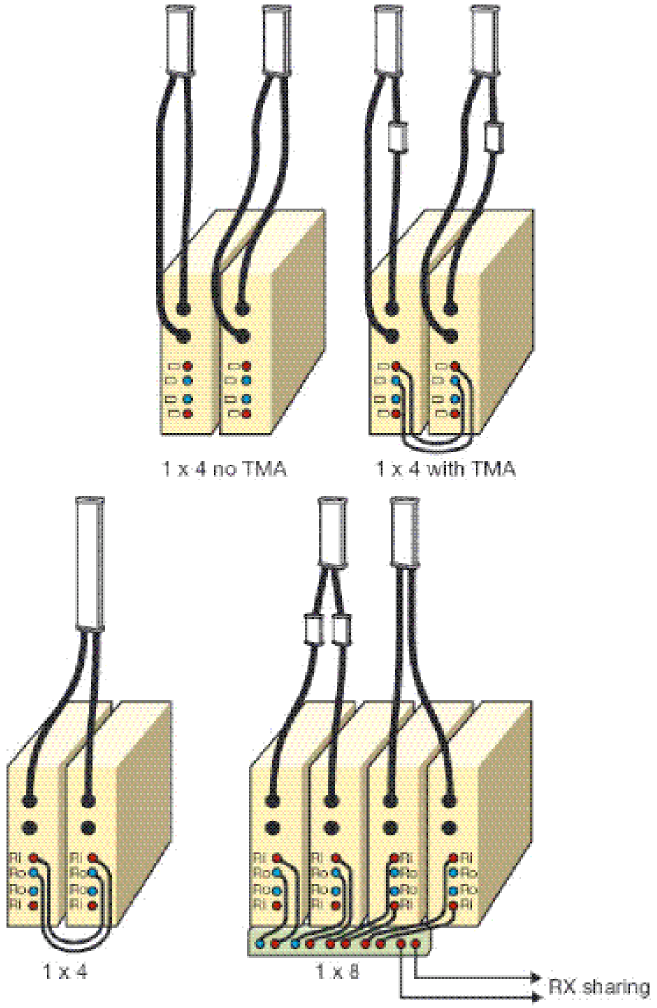


Figure 9
Top: Example capacity configurations. Bottom: Example coverage configurations.

DRU characteristics

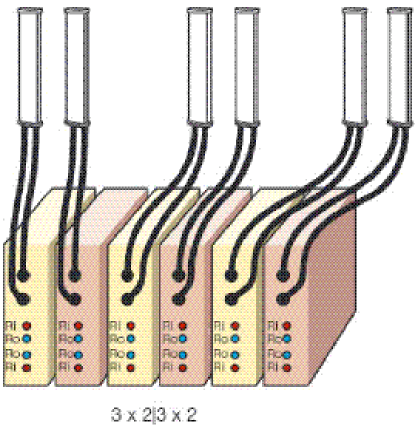
The normal operating temperature range of the DRU is +5°C to +55°C.

Its physical dimensions are 44.5x9x27cm. Hardware integration has made it possible to build compact twelve-transceiver radio base stations and reduce the number of cables between units. Six DRUs occupy a single shelf with a height of 44.5cm in a cabinet measuring 60x 40cm. The DRU supports EDGE, evolved EDGE, and transmitter coherent combining (TCC).

Configurations

RBS 2x16 has been designed to support a wide range of radio configurations. Different combinations use the DRU (with its RX distribution network), the recevier (passive splitter unit) and receiver cables. There are three classes or modes of configuration: capacity mode, coverage mode and supreme coverage mode. Dual-band configurations are described separately.

Figure 10
Example dual-band configuration.



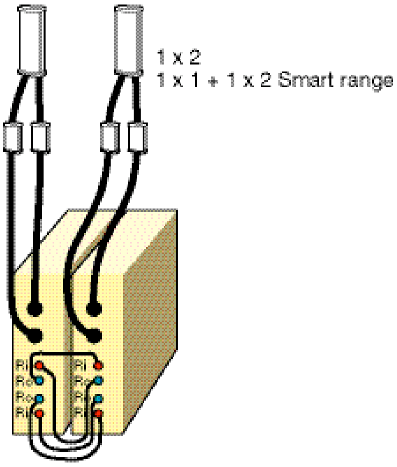


Figure 11
Example supreme coverage configuration.

Capacity configurations

Capacity configurations are combined transceiver configurations. Configurations exist for 1x2 up to 1x12. Figure 9 (top left) is a non-TMA 1x4 configuration that uses receiver cables to distribute signals between DRUs.

For larger-capacity configurations with tower-mounted antenna (1x6 and higher) an RXS (splitter unit) can be added to minimize the number of TMAs. Figure 9 (top right) illustrates a 1x8 configuration with TMA. RXS is also used in configurations with receiver-sharing (RX fed to another co-sited RBS).

Coverage configurations

Coverage configurations are uncombined configurations.

The 1x4 configuration without TMA (Figure 9, bottom left) requires no receiver cabling. This configuration can be expanded to up to 12 transceivers by adding DRUs. If TMAs are needed to increase uplink sensitivity, receiver cabling is used to distribute reception to the two DRUs (Figure 9, bottom right). This configuration uses two antennas for reception and transmission; the other two antennas are solely used for transmission. Two tower-mounted antennas are required.

Dual-band configurations

Figure 10 shows how dual-band configurations 3x2 | 3x2 (12 TRX) are built. One can build larger, combined dual-band configurations of up to 3x4 | 3x4 (24 TRX) using 3+3 1x4 combined configurations in two cabinets.

Supreme coverage configurations

To achieve supreme coverage, transmitter coherent combining is combined with four-way receiver diversity (4WRD). This configuration supports either 1x2 or 1x1 + 1x2 smart range. A cabinet can house up to three of these configurations (Figure 11).

Conclusion

The introduction of RBS 2x16 enables operators to lower the total cost of owning radio networks. For instance,

- an improved link budget means operators need fewer sites with which to build a network;
- new cooling techniques and a reduction in sites translates into reduced power consumption; and
- improved, more flexible installations reduce the costs of network rollout and civil works.

RBS 2216 doubles transceiver density compared with RBS 2206, yielding a footprint of 100 transceivers per square meter. The compact building practice facilitates capacity growth, change-outs and modernization activities.

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Third design release of Ericsson's WCDMA macro radio base stations

Bo Berglund, Michael Englund and Jonas Lundstedt

The market for WCDMA has taken off in several regions around the world. Europe, East Asia and Australia, for example, are each reporting accelerated growth in subscriber uptake. Many operators, after a successful rollout of coverage, are now also offering high-quality networks that carry steadily increasing loads of voice and data traffic.

Three 3G standards are competing for subscribers: WCDMA, CDMA2000 and TD-SCDMA. To sustain continued growth in regions where customers are accustomed to excellent 2G handsets, services and high-speed fixed broadband access, operators of 3G networks must offer even better services and greater mobility. Moreover, they must keep their tarrifs competitive. Consequently operators are very interested in peak performance, capacity, and cost-effectiveness.

This article discusses how Ericsson's new, third release of its WCDMA macro radio base stations (RBS) capitalize on advances in technology to improve the architecture of the RBS node to meet the challenges described above and to help operators target new business opportunities. The new design enables operators to double node capacity, increase coverage, simplify maintenance, and dramatically reduce power consumption. The combined effect of these enhancements yields considerably lower capital expenditures (CAPEX) and operating expenses (OPEX) in the radio access network (RAN).

The authors briefly review Ericsson's WCDMA RBS development strategy, giving examples of important design choices and explaining how the architecture has evolved to fit new market requirements and exploit advances in technology. In particular, they discuss the improved RBS architecture, advances in multicarrier power amplifier (MCPA) linearization technology, and design aspects of importance to high-speed downlink packet access (HSDPA) and the enhanced uplink (E-UL). The authors also introduce Ericsson's newest macro base station members of the RBS 3000 family.

Initial phases

Background

Ericsson's strategy for 3G network development is to release products and features in accordance with customer needs at different phases of network roll-out (Figure 1). The most important customer needs during the first phase, commercial launch, are

- rapid rollout (mainstream site concept);
- efficient training of staff;
- stability; and
- future-proof investment (backward and forward compatibility).

First RBS design release – commercial launch

Ericsson released its first indoor and outdoor macro base stations (RBS 3202 and RBS 3101) in early 2001. The products were based on the first commercial RBS design release (RBS R1).

Although time to market was a priority consideration for this first release, Ericsson did not compromise on the future-proofness of its products. For example, they could be expanded to support six sectors and four carriers with transmit and receiver diversity.

The commercially available technology in 2001 – signal processing with digital signal processors (DSP), field programmable gate arrays (FPGA), and linearization technologies based on feed-forward techniques – enabled a 3x2 configuration in a single cabinet with the same footprint as the GSM RBS 2000 base station (600x400mm). The architecture also supported larger configurations via digital interconnection of up to four cabinets.

It is worth noting that close collaboration between design, research and standardization projects ensured that the early architecture would later also support HSDPA and E-UL. Indeed, provisions for the complete radio frequency (RF) transmitter chain were built into the RBS R1 from the start, supporting the full HSDPA implementation with higher-order modulation without degradation of output power.

One other crucial design choice was to base the RBS on the Connectivity Packet Platform (CPP) for control, operation and maintenance (O&M), transport network interfaces, switching functionality, and synchronization.[1] CPP, the foundation of every switching node in Ericsson's WCDMA radio access network, simplifies RAN operation and maintenance, and in terms of transmission functionality, it guarantees common evolution of the entire radio access network. Most importantly, however, CPP ensures that every node in the radio access network is truly able to meet future requirements relative to evolving radio network functions and capacity (including IP transport network and capacity enhancements such as HSDPA and E-UL).

Second RBS design release – increasing capacity and performance

The requirements of the second phase, whose focus is on broad (nationwide) coverage, can be summarized as follows:

- greater flexibility (more configurations);
- continued focus on outdoor macro coverage solutions; and
- greater emphasis on in-building coverage solutions.

Ericsson's second RBS design release (RBS R2) improved on the architecture and subsystems in RBS R1 and introduced software support for additional configurations.

Ericsson also broadened its RBS portfolio by introducing the Super-compact (RBS 3104), Micro (RBS 3303) and Main-remote (RBS 3402) base stations for challenging sites and dedicated in-building coverage solutions (Figure 2).

New ASICs enabled an eight-fold increase in uplink capacity per board. Likewise, new clipping algorithms and an enhanced feed-forward multicarrier power amplifier (MCPA) improved power efficiency from 9 to 11% and enabled a new, high-power 30W power class of products.

New receiver algorithms and an improved receiver noise figure in the uplink (UL) accompanied the new high-output power option in the downlink (DL). These enhancements improved receiver sensitivity by up to 2dB and the effective coverage by more than 20%.

As demonstrated by the in-service performance (ISP) figures collected from the more than 40 commercially launched WCDMA networks powered by Ericsson nodes in the radio access network, the first and second RBS design releases have each performed satisfactorily with respect to set requirements. Cell availability and dropped-call rates have continuously improved in recent years, despite the addition of new RAN functionality and increasing traffic. The average ISP figures from these commercially deployed networks are already on par with the ISP figures of mature GSM networks.

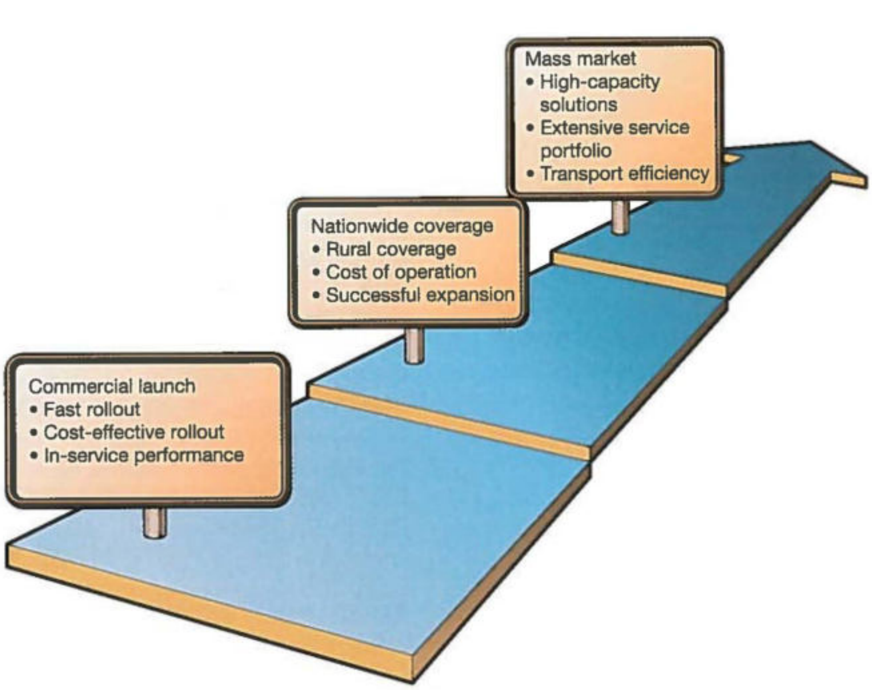

Mass market
• High-capacity solutions
• Extensive service portfolio
• Transport efficiency
Nationwide coverage
• Rural coverage
• Cost of operation
• Successful expansion
Commercial launch
• Fast rollout
• Cost-effective rollout
• In-service performance

Figure 1
Various phases of network rollout.

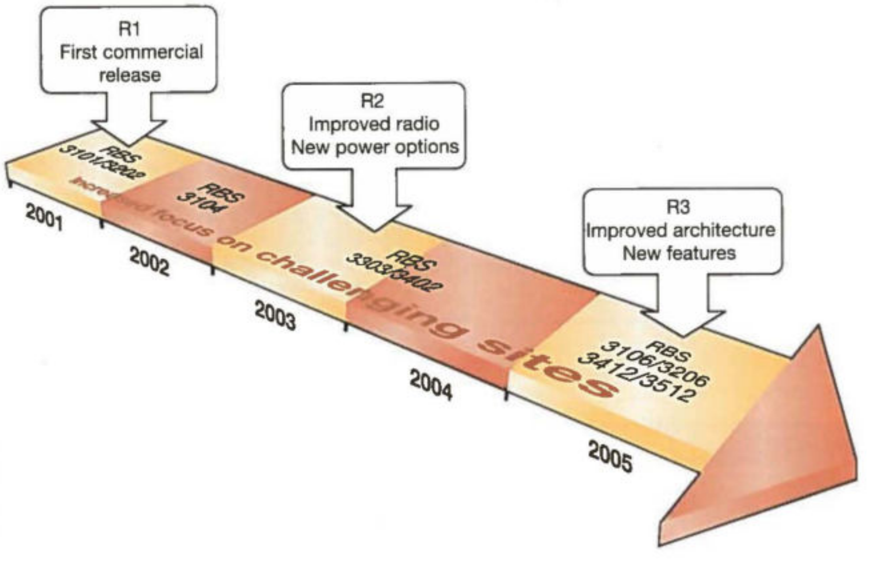
RBS R3 development

Changing needs, technology advances, and lessons learned

Since the first launch of WCDMA, two aspects in particular have changed:

- OPEX has very rapidly become a primary operator concern (much more quickly than in previous system generations such as GSM); and
- the emergence of, and need for, new frequency bands, including the requirement for dual-band implementations.

Figure 2
Ericsson's RBS hardware releases.


R1
First commercial release
R2
Improved radio
New power options
R3
Improved architecture
New features
RBS 3101/3202
RBS 3104
RBS 3303/3402
RBS 3106/3206 3412/3512
Increased focus on challenging sites
2001
2002
2003
2004
2005

Slow uptake of traffic in 3G networks from 2001-2004 put many operators in a financial bind, forcing them to find ways to cut their operating and capital expenditures. Nearly 15% of an operator's total costs can be attributed to radio network-related OPEX; 10% to radio network-related CAPEX. In other words, the radio network accounts for nearly 25% of an operator's total costs. Therefore, in the context of cost effectiveness, radio network-related OPEX and CAPEX play a very prominent role.

The network cost structure, briefly described in *GSM network solutions for new-growth markets*, consists of numerous components but it can be assumed that the total cost is more or less proportional to the number of sites in the network.[2] The cost of the RBS, in turn, typically represents 20-40% of the cost of the site it occupies. Therefore, RBS enhancements that reduce the number of sites as well as lower site cost have a large impact on overall cost. Examples of characteristics that affect number of sites are output power and receiver sensitivity. Examples of characteristics that have a direct impact on site cost are:

- RBS footprint (and required number of cabinets);
- power supply (flexibility, integrated or external); and
- cooling requirements (RBS power efficiency).

Power consumption and ease of installation and maintenance also directly affect cost.

Advancements in technology have made it possible to increase capacity per node and RBS power efficiency. In particular, recent advances in the areas of DSP capacity, baseband ASIC development, and MCPA linearization have vastly increased the potential density or ratio of capacity per volume. Greater density means that one can grow capacity without increasing footprint or volume. Obviously, this facilitates site acquisition and planning. Improved power efficiency also reduces power bills and lowers CAPEX and OPEX associated with cooling, power supply and battery backup systems.

Experience of GSM and the two previous WCDMA RBS design releases has proven the importance of forward and backward compatibility. Operators have come to expect that the functionality of installed equipment can be upgraded in harmony with the rest of the network. In short, the RBS must represent a secure investment. It must be reliable, expandable and compatible with future investments. In this context, Ericsson made an important choice basing all its RAN nodes around a common 3G platform (CPP). The same can be said for Ericsson's unwavering stance on upgradeability and compatibility. Certainly these choices called for a fundamentally larger design effort leading up to the first commercial release of the 3G RAN products, but because each subsequent 3G node from Ericsson derives from the same platform, operators know they can evolve their nodes.

The platform concept is one reason Ericsson has the most complete WCDMA product portfolio in the industry. It already covers three frequency bands, and at least two more frequency bands are planned for the coming year.

Third RBS design release

Ericsson began its studies for RBS design release 3 (RBS R3) in 2001. This was the same year that products based on RBS R1 appeared in the market. The objective of the studies was to incorporate 3G RBS design experience and experience gained from developing and adapting GSM to new market requirements.

TABLE 1: SUMMARY OF DESIGN ENHANCEMENTS IN RBS R3.

- 15-35% increase in nominal output power: this translates into increased downlink coverage (up to 20%) and nominal output power of up to 120W per sector
- Improved static sensitivity: -128.5dBm for 3GPP 12.2kbps 10^{-3}BER and two-way receiver diversity (2100MHz)
- Twice as much capacity per cabinet: now up to 3x4 or 6x2 in one cabinet with Ericsson's standard 600x400mm footprint with no requirements for ventilation space at sides or rear
- Dual-band support in one cabinet, for instance, 3x2 1900MHz + 3x2 850MHz
- Integrated RRU support: the reuse of existing site power, baseband and transmission infrastructure yields low site cost during network expansion
- Reduced power consumption: the power consumption of a typical 3x2 20W (2100MHz) is down 55% to 0.8kW
- 70% increase in availability, which translates into fewer site visits and lower repair costs
- Integrated AC and DC power options: a single-cabinet self-contained RBS can now support up to 12 cells in two frequency bands
- Simplified architecture: compared to earlier design releases, a 3x1 configuration in R3 requires half as many plug-in units (PIU), one-third as many O&M processors, and half as many interconnects

The first two RBS design releases laid the foundation for the O&M and transmission platform, radio performance, in-service performance, and upgradeability. The focus of the RBS R3 design effort was thus primarily on reducing total cost of ownership (TCO) and on facilitating greater R&D effectiveness in preparation for the upcoming multitude of frequency bands and configuration requirements. The focus, in terms of reducing TCO, was on

- increased-coverage solutions – which translates into fewer sites;
- more than twice the capacity per cabinet – based on the same best-in-market footprint;
- multiband support;
- significantly lower power consumption;
- even greater reliability through simplified architecture and integration;
- integrated power supply; and
- drastically simplified maintenance through modularity.

The R&D efficiency was greatly enhanced thanks to reduced complexity in the architecture and improved product flexibility, for example, by developing more integrated subsystems.

In addition, one of Ericsson's strategic environmental goals has been to reduce power consumption. An important conclusion of extensive life-cycle assessments (LCA) conducted since the mid-1990s is that the most significant impact of telecommunications systems on the environment is linked to energy consumption from operations. Furthermore, in this context, radio base stations are the single largest consumers of energy.

The RBS R3 development successfully transitioned to series production in the first quarter of 2005. Table 1 contains a brief summary of the RBS R3 design enhancements.

RBS R3 architecture

Ericsson Review reported on RBS R1 and R2 products and architecture in 2000 and 2003.[3-4] Figure 3 shows how Ericsson improved modularity, going from R2 to R3 by means of higher-order integration. In essence, Ericsson's designers increased subsystem integration in virtually every RBS function area while maintaining compatibility with important interfaces, such as *Iub* and *Uu*, antenna systems, and the internal baseband. To operators, this means larger configurations in one cabinet, significantly lower power consumption and improved availability – due to new MCPA linearization techniques, O&M and transport network integration, and an improved cooling concept.

Flexible configurations and compatibility

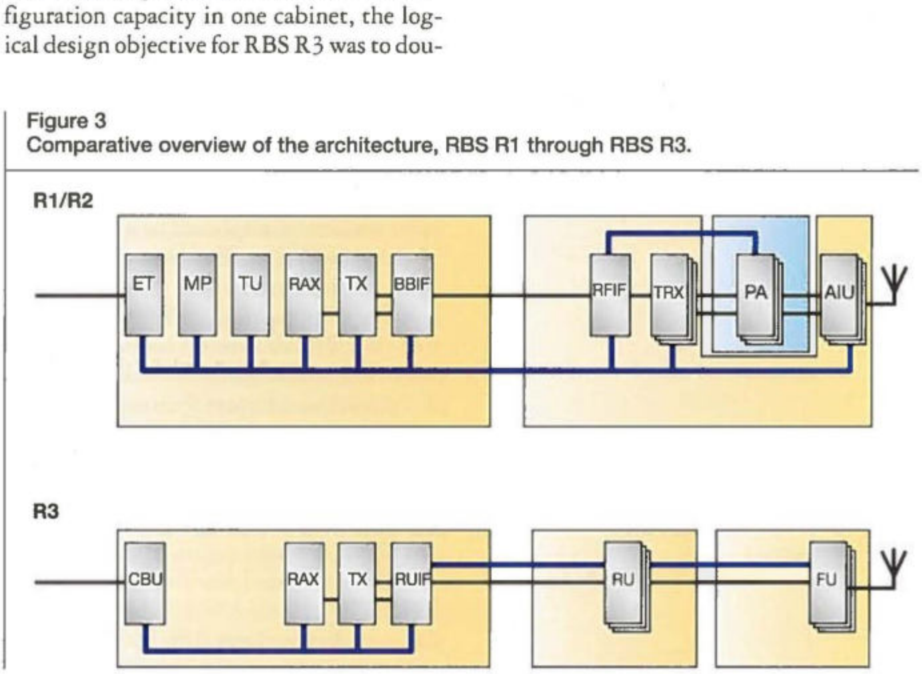
The market has been very clear in spelling out its demands for one-cabinet solutions. Many operators, for example, want self-contained indoor cabinet solutions with integrated power. Likewise, dual-band WCDMA is being built out in North America and will also probably become a requirement in other markets. Certainly, a one-cabinet dual-band solution offers several advantages: resource pooling, small footprint, low power consumption, simpler expansion and reduced maintenance. Ericsson designed the new RBS R3 with these attributes in mind. It supports all planned configurations in one cabinet, accommodating up to four carriers per sector, six-sector or dual-band configurations.

The new baseband boards (TXB and RAXB) are fully compatible with earlier releases, as are the new CPP boards, the exchange terminal boards (ETB) for transmission, and the general-purpose boards (GPB). The entire radio network can thus evolve very smoothly in terms of transport (for example, IP transmission) and radio functionality (such as HSDPA services).

Radio

Given the requirement to double the configuration capacity in one cabinet, the logical design objective for RBS R3 was to dou-

Figure 3
Comparative overview of the architecture, RBS R1 through RBS R3.



ble the available output power per cabinet. In fact, Ericsson exceeded this goal to improve individual carrier capacity.

Greater output power is always beneficial for downlink coverage and capacity. The extent of this benefit is determined by several variables, such as cell size, the inclusion or exclusion of tower mounted amplifiers and antenna system controllers (TMA/ASC), feeder losses, and the mobile phone. In the 20W power class, for example, assuming ASC and 3dB feeder loss, network tests have shown a close relationship between "useful" output power and downlink cell capacity. In other words, an increase to 30W typically yields a 30% increase in downlink cell capacity.

The task of doubling available output power per cabinet (without increasing cabinet size) entailed re-examining the entire design: power supply, cooling, integration of subsystems, internal jumpers, filter design, and power amplifiers.

Radio architectures with the greatest potential (in terms of efficiency, flexibility and capacity per volume) make use of radio units (RU) and filter units (FU), where a radio unit is a complete transceiver and MCPA (Figure 3). The filter unit is composed of the front end: transmitter and receiver cavity filters, low-noise amplifiers, logic and internal bias-Tee for communication, power feed over feeder to ASCs and remote electrical antenna tilt (RET), and lightning protection.

This simple and elegant architecture has few building blocks and few interfaces. Furthermore, it accommodates ongoing technical evolution relative to power amplifier design, because the digital and analog parts of the transceiver are integrated with the power amplifier.

The improved power consumption efficiency and maximum output power capability are good examples of the achievements of the new design. For example, the 3x2 20W configuration in the 2100MHz band is more than twice as efficient as that of RBS R2. The maximum output power is more than 400W for an R3 cabinet (at top of cabinet) as compared to approximately 180W for the R2 cabinet. This large increase in output power capability facilitates large single and dual-band configurations without compromising downlink cell capacity.

Baseband

Ericsson designed the RBS 3000 baseband architecture to ensure smooth and long-term evolution of functionality and capacity. One important feature of the baseband architecture is the separation of the uplink and downlink into different resource pools. A drawback of this design choice is the need for additional inter-board interfaces and thus greater need for architectural system planning, to ensure future compatibility. But once these hurdles had been cleared the benefits were quite substantial. For instance, one can optimize the uplink and downlink independently using different technologies for each. One may also dimension node capacity according to traffic needs, which improves cost-effectiveness. This benefit will be especially pronounced as data traffic volumes increase, because the downlink typically carries six times more data traffic than the uplink. The design also doubles pooling efficiency by introducing larger resource trunks, and giving the system full freedom to use all the available resources on all individual uplink and downlink boards – that is, there are no restrictions put on the allocation of necessary downlink and uplink radio link resources as would have been the case had the resources been on the same board.

Key characteristics of the baseband architecture, to accommodate new functionality and greater capacity throughout the lifetime of 3G, are efficient resource utilization and high capacity. Although the channel element (CE) is a resource equivalent not standardized by 3GPP and thus defined differently by different vendors (the definition differs in how many CE are required for a given service, whether CE resources are required for common signaling, compressed mode measurements, and so on), it represents a simple and intuitive measurement of baseband capacity.

The RBS R3 architecture can boast the largest baseband capacity in the industry in a single, standard-sized cabinet: 1536CE in both the uplink and downlink. Given future emphasis on downlink data services, the channel element data efficiency is particularly high in the downlink. Ericsson's 1536CE data capacity in the downlink is equivalent to 2000-3100CE, depending on the industry norm used to express number of channel elements for different data services.

Ericsson has employed higher-order integration to obtain very high baseband capacity. Its most recent baseband boards (RAXB and TXB) use proprietary ASIC design and new, high-capability DSPs to give 128 and 384CE per board, respectively.

For HSDPA and E-UL, the baseband architecture employs large-scale pooling of high-speed data resources and a common scheduler. The present TX board supports up to 45 HSDPA codes. By pooling the HSDPA downlink resources with R99 downlink resources it is possible to optimize the scheduler in terms of available downlink power and traffic. A fast scheduler has a positive impact on network latency, or in other words, on the end-user experience.

The RBS R3 architecture maintains compatible internal baseband interfaces and employs high-capacity boards to serve higher-order configurations. Every uplink and downlink board is compatible with RBS R1 and R2, which is to say the entire network can benefit from functional and performance enhancements to the baseband.

Control

The RBS control architecture, based on CPP, provides switching and basic O&M and transport functionality.[1] The main processor handles RBS operation and maintenance and controls traffic and switching. Processing power can be pooled via several main processors, for example, for redundancy, to handle increased traffic, or to provide greater ATM adaptation layer-2 (AAL2) switching capacity.

The control base unit (CBU) is a new control subsystem that integrates a main processor, 16Gbps switch core, timing unit, and E1/T1/J1 interface board. It has been introduced to improve space efficiency, power efficiency, and increase availability. The CBU represents a minimum set of mandatory functions for any configuration. The combined subsystem is half as large as the corresponding size of the subsystems it replaces.

Transport

The transport functionality is based on CPP. Different exchange terminal boards provide the optical or electrical interfaces to SDH, PDH, ATM or IP networks. An internal switch core handles dedicated point-to-point connections between the ETB and the corresponding RAXB, TXB or another ETB. The switch core can switch up to 16Gbps, making it suitable for use as large HSDPA and E-UL nodes or as a transport hub. As network traffic increases, the switch core, boosted by the AAL2 switching capacity of the main processor, will play an increasingly prominent role.[5]

E1/T1/J1 interfaces have been integrated into the CBU subsystem to simplify the handling of standard, small- and medium-sized RBS configurations.

Mechanics and power

The indoor and outdoor cabinets have been reorganized to make room for internal power supplies, the new subsystems, auxiliary systems and improved battery backup. To save space, reduce power consumption and increase availability, the cooling system now employs a central fan instead of dedicated subrack fans. New fan-control algorithms make use of hot-spot measurements, taking into account unique board characteristics and sound levels. As the subsystems evolve over time, the fan control subsystem will automatically load board characteristics on to new boards and adjust the fan speed accordingly.

The new cooling concept continues to employ the chimney principle of past RBS designs (Figure 4). Because no ventilation space is required, cabinets can be placed side-by-side, back-to-back or back-to-wall.

To further improve availability and reduce scheduler maintenance, the outdoor cabinet is cooled by means of a heat exchanger (standard).

The new integrated power option supports +24VDC, -48VDC and mains-supply AC. This option eliminates the need for an extra power cabinet.

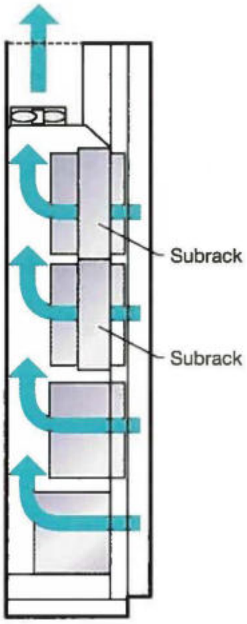


Figure 4
Cooling principle.

RBS 3000 R3 macro base stations

The RBS R3 macro base stations complement Ericsson's existing product portfolio. Considerable effort has been made to ensure compatibility between the releases. At the same time, new capabilities have been added, including dual-band, larger capacity per cabinet, and improved power efficiency. To start with, Ericsson is releasing five new macro base station cabinets: three indoor and two outdoor versions.

Indoor cabinets

The three indoor cabinets share similar characteristics, such as integrated power supply and transmission hub functionality. In essence, they differ only in terms of targeted maximum configuration.

The RBS 3206E can house nine radio units for large, dual-band configurations with very high output power capability.

The RBS 3206F can house six radio units and is suitable for high- to very-high-capacity configurations, including dual-band with high-output capability.

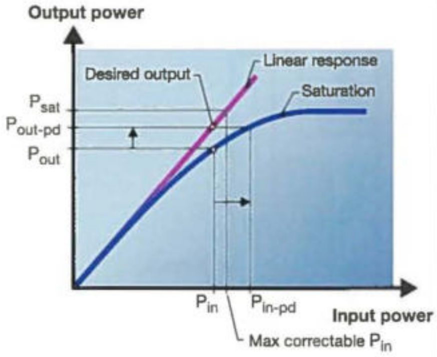


Figure 5
Digital predistortion (DPD) principle.

The RBS 3206M targets medium- to high-capacity configurations. The standard configuration calls for three radio units.

Outdoor cabinets

The RBS 3106 outdoor cabinet has the same footprint as the GSM 2106 and WCDMA RBS 3101. It can be configured in the same way as the RBS 3206E – that is, with up to nine radio units – and includes an integrated power and battery backup system.

Apart from supporting much larger configurations than its predecessor (RBS 3101), the RBS 3106 now also features a heat exchanger cooling system (standard).

The narrow depth and low height of the slim-sized RBS 3107 gives operators greater flexibility in terms of site acquisition.

RBS R3 key technologies

Power efficiency

Power efficiency has an environmental impact and affects operating costs. Lower power consumption can reduce costs for energy and reduces the demand charge (contract ampere). Ericsson's life-cycle assessments show that reducing RBS power consumption goes a long way toward reducing the total environmental impact of telecommunications services.[6] The assessments conclude that an energy savings of 1kWh is equivalent to keeping 0.6kg C02 from entering the atmosphere.

RBS power efficiency is affected by every part of the node (baseband, control parts, power supply units, and internal and external cooling due to heat dissipation) but the dominating factor is power amplifier efficiency.

New linearization technology

The main driving factors for introducing a new linearization technology are the potential

- to drastically increase power amplifier (PA) efficiency; and
- to increase RBS capacity in a given footprint (increased density).

Adaptive baseband digital predistortion (DPD) is a mature technology that has moved from research labs into deployed products. When combined with advanced peak power reduction algorithms, DPD significantly improves efficiency compared to the feed-forward PAs used in earlier releases.

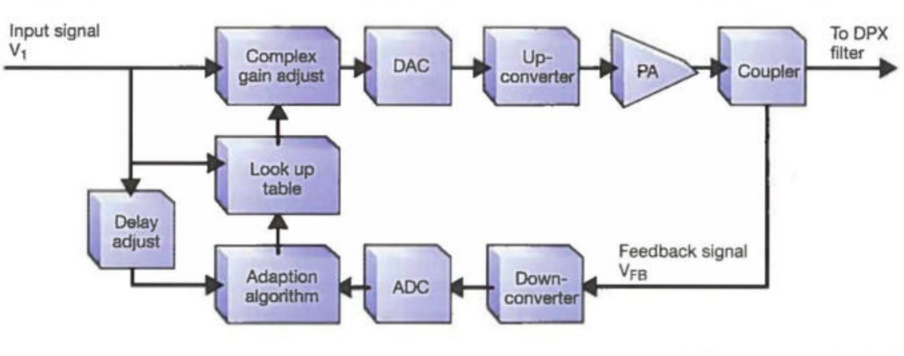
For WCDMA four-carrier operation, power efficiency of the transmitter chain (that is, transceiver and power amplifier) can be improved from typically less than 10% to around 15%. DPD technology enables the active radio parts of the RBS to be integrated into a complete radio unit (RU) with digital baseband input signals.

Adaptive DPD

The baseband signal is predistorted before modulation, up-conversion, and amplification in the power amplifier. Figure 5 shows the relationship between the PA input signal and output power. The PA curve before linearization is nonlinear until it reaches saturation. With DPD, the PA curve is forced to have a linear response over a specific operating range. Figure 6 shows a block diagram of the complete DPD system.

Before entering the DAC, samples of the baseband input signal are multiplied by complex coefficients drawn from the look-up table (LUT). The LUT coefficients, which implement the predistortion function, are updated according to changes in PA behavior relative to changes in traffic, the environment, and aging effects.

Figure 6
Block diagram of adaptive baseband digital predistortion (DPD).



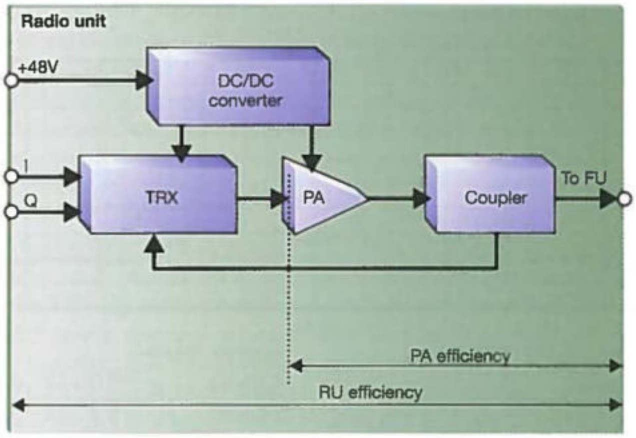


Figure 7
Efficiency definitions.

Ordinary memoryless DPD algorithms are not well suited to cope with the PA memory effects created by rapid dynamic changes in average power level. To mitigate these effects while still fulfilling the most stringent 3GPP linearity requirements, Ericsson has developed advanced DPD algorithms with fast adaptation. To achieve optimum efficiency the DPD is combined with peak power reduction algorithms that reduce the signal peak to average value without sacrificing error vector magnitude (EVM) properties. The hardware is composed of DACs, ADCs and LD-MOS power transistors that linearize four WCDMA carriers over a 20MHz operating bandwidth. One can easily adapt the architecture to power amplifiers with different output power levels, amplifier technologies, and new RF power transistor technologies.

The following definitions are necessary for comparing efficiency values (Figure 7):

- power amplifier efficiency includes the driver and final stages as well as losses in the PA output network;
- radio unit (RU) efficiency includes the DC/DC converter, the TRX unit, and the PA as defined above.

Measurements show a significant efficiency improvement with DPD compared to the RBS R2 with analog feed-forward amplifiers. Figure 8 shows the typical measured RU efficiency versus the P_{out} curve. The measurements, taken at room temperature, measured 30W RBS power using 3GPP test model 1 (TM1) signals.

The efficiency at maximum power (46dBm/40W) is 15%. The corresponding DC power consumption is 270W for a complete radio unit. By comparison, an RBS R2

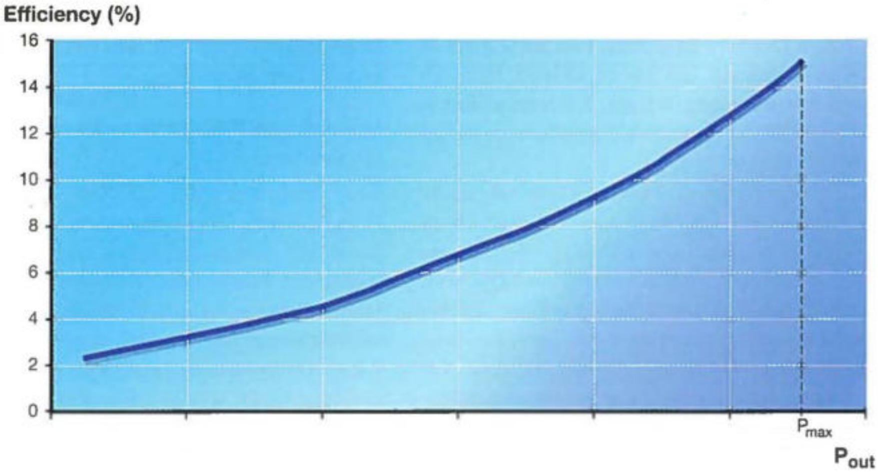
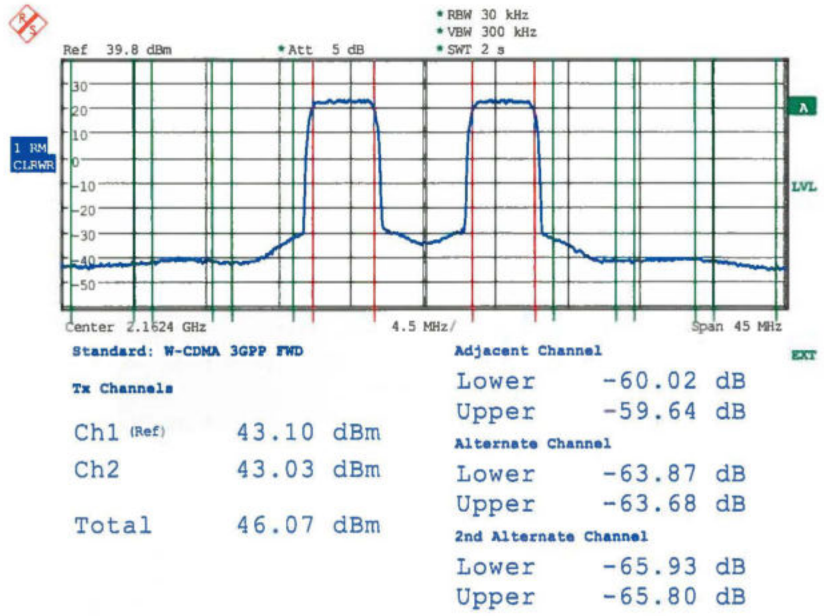


Figure 8
Typical RU efficiency curve.



```
                                   *RBW 30 kHz
                                   *VBW 300 kHz
Ref 39.8 dBm        *Att 5 dB      *SWT 2 s

Center 2.1624 GHz                  4.5 MHz/                  Span 45 MHz
Standard: W-CDMA 3GPP FWD          Adjacent Channel
Tx Channels                        Lower      -60.02 dB
                                   Upper      -59.64 dB
Ch1 (Ref)      43.10 dBm           Alternate Channel
Ch2            43.03 dBm           Lower      -63.87 dB
                                   Upper      -63.68 dB
Total          46.07 dBm           2nd Alternate Channel
                                   Lower      -65.93 dB
                                   Upper      -65.80 dB
```

Figure 9
Measured adjacent channel leakage power ratio (ACLR) in the RU21.

feed-forward MCPA with TRX typically consumes 400W at this power level.

Figure 9 shows the measured performance or adjacent channel power leakage ratio (ACLR) of RU21 at P_{max} (40W). The measurement was taken using two WCDMA carriers in 15MHz bandwidth (2162.4MHz center frequency), the carriers were modulated with a 3GPP TM1 signal. The ACLR and spurious emission responses are well within the stipulated requirements.

Further efficiency enhancements

Proceeding from the proven DPD design, the RBS R3 also supports other efficiency-enhancing technologies and new power transistor technologies. Doherty technology, for example, increases the average efficiency of a power amplifier with little increase in complexity.

In a Doherty amplifier, two amplifiers of equal capacity can be combined through quarter wavelength lines. Each amplifier is designed to give maximum power at a load of 50 ohms.

The main PA is biased in Class AB, while the peak PA can be biased in Class AB or Class C (Figure 10). When the signal amplitude is half, or less than half, of the peak amplitude only the main PA remains active; the peak PA is switched off. Each PA contributes to the output power when the signal exceeds half the peak amplitude. In reality, the main PA load is modulated with changes in output power.

Figure 10
Doherty PA principle.

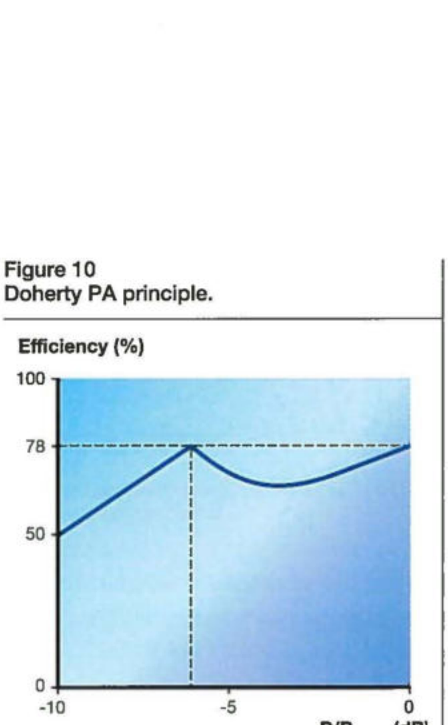


Figure 11 shows the efficiency curve for this coupling, using two PAs. Peak efficiency is set at 6dB back-off. Other division ratios may be used to shift the curve to the left or right to match the actual signal peak-to-average ratio.

Because the Doherty architecture is inherently non-linear, a good linearization technology is required to fully exploit the efficiency enhancement properties. The product verification measurements have proven that a Doherty PA combined with advanced DPD algorithms can meet the stringent 3GPP linearity requirements and still significantly improve efficiency.

Figure 12 shows that the introduction of Doherty power amplifiers increases RU efficiency to around 20% at P_{max}. The Doherty effect is very evident when compared with the pure DPD PA curve (Figure 8). A large improvement in efficiency occurs at around 6dB below P_{max}.

HSDPA and R99 traffic with optimal capacity

The inclusion of HSDPA in 3GPP Release 5 represents a major improvement in WCDMA capacity, latency and peak rate. Thanks to higher-order modulation, fast retransmissions and fast link adaptation, the downlink can attain a maximum bit rate of 14.4Mbps with average cell throughput of up to 5Mbps. HSDPA increases the capacity of the air interface two- to three-fold, yielding a much-improved end-user experience. It also has the potential to improve cost-effectiveness in the radio access network.

An important aspect of HSDPA is that it can either be enabled on the same carrier as R99 traffic, to make optimum use of carrier resources, or on a separate carrier, to provide dedicated capacity for mobile broadband.

The different deployment scenarios put different functional and performance requirements on the RBS. In terms of radio design (scheduler, power resource allocation, transmitter linearity) it is straightforward to deploy HSDPA and R99 on separate carriers, which results in a large, dedicated resource for mobile broadband. However, in the context of radio resources, deploying HSDPA and R99 traffic on the same carrier is an attractive option, because the carrier can be used as a common resource pool for high-speed, best-effort data and dedicated voice and data traffic.

Given that R99 traffic consists of fixed common channels and power-controlled dedicated channels, the carrier must be dimensioned with an output power margin that can handle varying instantaneous power demands. Resources go unused whenever the output power falls below the nominal output power. HSDPA can employ unused output power without any negative impact on R99 traffic. The HSDPA traffic is simply allocated whatever power is available after the R99 demand has been met. HSDPA power allocation is updated dynamically every 2ms (Figure 13).

Efficient output power handling for HSDPA

Efficient management of output power resources for a common HSDPA and R99 carrier is dependent on a variety of parameters, including

- dynamic output power allocation;
- TX chain linearity; and
- fast congestion control.

As mentioned above, an effective implementation dynamically allocates all excess output power to HSDPA (Figure 13). The system updates the HSDPA output power every 2ms. By contrast, it updates R99 radio link power in increments of 1dB every 0.67ms. R99 power-controlled traffic can thus request an increase of up to 3dB in output power before the HSDPA power setting has been updated a second time. In a scenario with 8W average power-controlled R99 traffic, this 3dB increase is the equivalent of 8W. If all temporarily available output power were to be allocated to HSDPA, then fluctuations in R99 power might overdrive the TX chain, resulting in modulation errors, spectrum emissions or even forced MCPA shutdown. A standard solution to prevent this from occurring is to restrict the power allocation to HSDPA by means of an HSDPA power margin. However, HSDPA power margins lower throughput for both HSDPA and R99 traffic. Ericsson's solution is to employ an RBS downlink fast congestion control mechanism which ensures that the TX chain is never overdriven by fluctuating R99 traffic. This way, full power capability is available for HSDPA and R99 traffic.

TX chain linearity

In oversimplified terms, an amplifier design is based on peak and average power requirements. The maximum average power is determined by the cooling design, and the peak power is determined by linearization performance and allowable spectrum emissions. The peak-to-average ratio (PAR) has a direct impact on power efficiency. Low PAR yields a more efficient amplifier. This is why peak clipping functions are used to

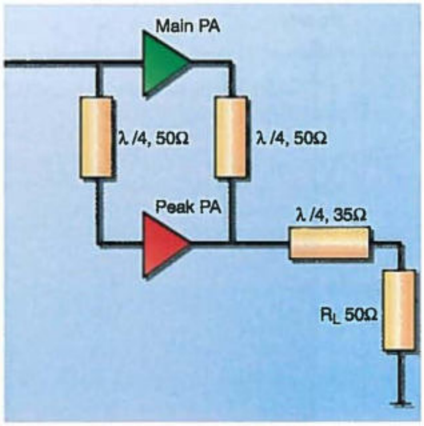


Figure 11
Ideal Doherty PA efficiency curve.

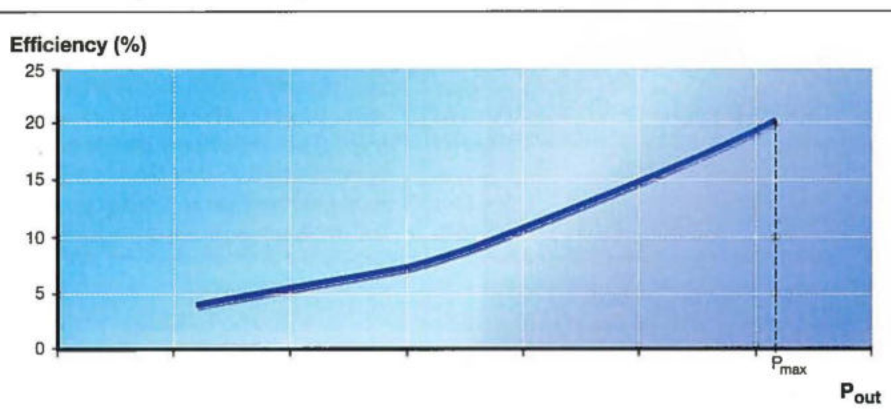


Figure 12
Efficiency vs. P_{out} curve obtained from RU with prototype Doherty PA.

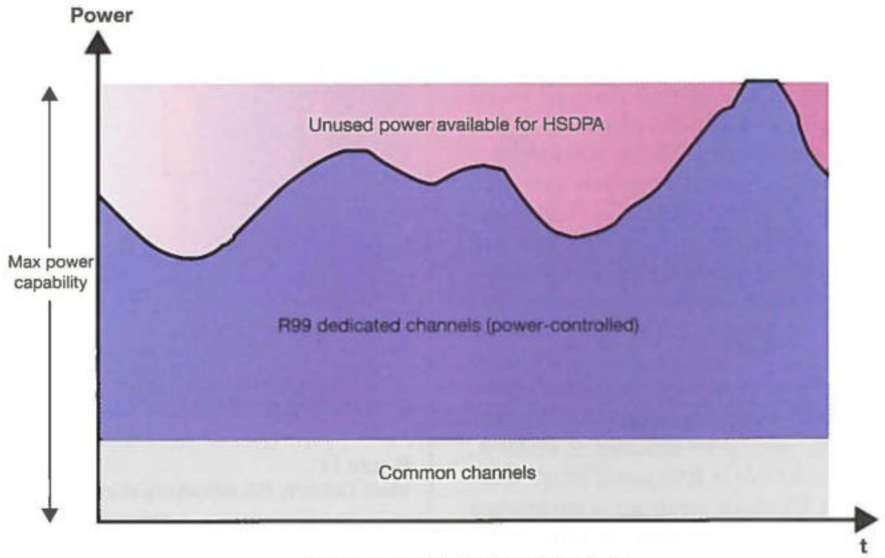
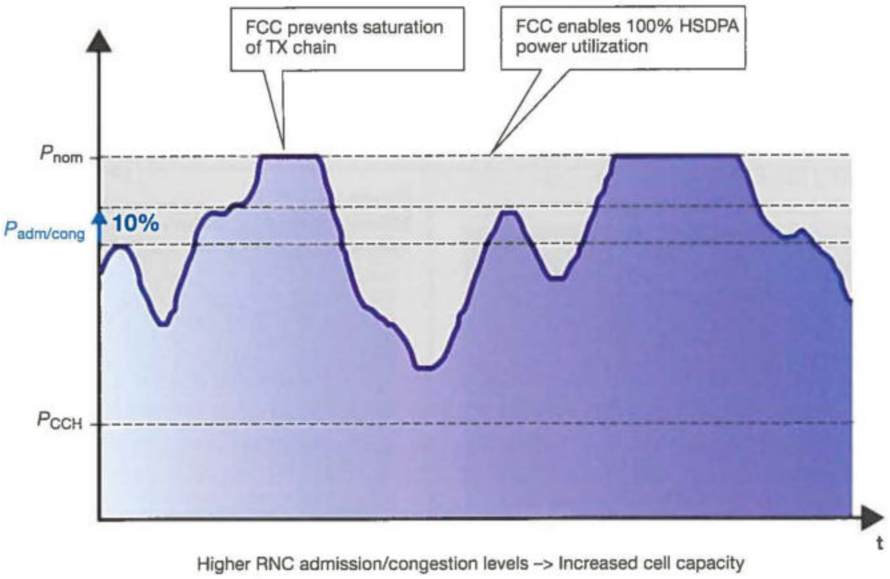


Figure 13
Fast congestion control.

Figure 14
HSDPA traffic utilizes available output power.



hold power peaks down while maintaining adequate modulation accuracy. The introduction of HSDPA requires higher-order modulation, which

- infers higher PAR; and
- requires more accurate modulation.

The clipping algorithm sees higher peaks but must have less impact on the modulation waveform. The clipping must thus be designed with 16QAM modulation in mind. Otherwise, to meet requirements for modulation accuracy, one must back the signal off. Also, because increased signal peaks influence the spectrum emission of the power amplifier, its linearity must be prepared for HSDPA.

In comparison with R99, the higher-order modulation (16QAM) of HSDPA puts more stringent requirements on transmitter chain linearity and the performance of clipping algorithms. A strictly 3GPP R99-compliant transmitter chain would require power back-off of approximately 1.6dB (30%) to meet the tougher requirements imposed by HSDPA. In the 20W power class, this would be equivalent to an undesirable 6W drop in nominal output power or a 30% drop in cell capacity. To avoid this power back-off when introducing HSDPA, Ericsson designed its RBS products to have larger dynamic range and better linearity and modulation accuracy than stipulated by 3GPP R99.

Fast congestion control

The two central, shared resources in the downlink are the code tree and output power. The admission control function serves to ensure that admitted users enjoy a high likelihood of obtaining the output power and codes needed for their services. The congestion control function takes actions to lower output power when the carrier power level exceeds a given threshold. Poor congestion control (weak, slow response) calls for severe actions. Efficient congestion control (robust, fast response) calls for less severe actions, in which case the mean power can be maintained at a higher level. This also means that more users can be admitted into the cell. There is thus a direct relationship between the congestion control function and cell capacity.

BOX A, TERMS AND ABBREVIATIONS

2G	Second-generation mobile system
3G	Third-generation mobile system
3GPP	Third Generation Partnership Project
AAL2	ATM adaptation layer 2
ACLR	Adjacent channel leakage power ratio
ADC	Analog-to-digital converter
ASC	Antenna system controller
ASIC	Application-specific integrated circuit
ATM	Asynchronous transfer mode
CAPEX	Capital expediture
CBU	Control base unit
CDMA	Code-division multiple access
CE	Channel element
CPP	Connectivity packet platform
DAC	Digital-to-analog converter
DL	Downlink
DPD	Digital predistortion
DSP	Digital signal processor
ETB	Exchange terminal board
E-UL	Enhanced uplink
EVM	Error vector magnitude
FCC	Fast congestion control
FPGA	Field-programmable gate array
FU	Filter unit
GPB	General-purpose board
GSM	Global system for mobile communication
HSDPA	High-speed downlink packet access
ISP	In-service performance
LCA	Life-cycle assessment
LD-MOS	Lateral double-diffused metal-oxide semiconductor
LUT	Look-up table
MCPA	Multicarrier power amplifier
O&M	Operation and maintenance
OPEX	Operating expense
PA	Power amplifier
PAR	Peak-to-average ratio
PDH	Plesiochronous digital hierarchy
PIU	Plug-in unit
QAM	Quadrature amplitude modulation
R&D	Research and development
RAN	Radio access network
RAXB	Receiver and random access board
RBS	Radio base station
RET	Remote electrical antenna tilt
RF	Radio frequency
RNC	Radio network controller
RU	Radio unit
SDH	Synchronous digital hierarchy
TCO	Total cost of ownership
TM1	Test model 1
TMA	Tower-mounted amplifier
TX	Transmitter
TXB	Transmitter board
UL	Uplink
WCDMA	Wideband CDMA

Fast congestion control (FCC) is an RBS function that complements RNC congestion control. The function supervises the output power that users (all users) demand at the same time, using the same time scale as the fast power control function. If the total demand for output power exceeds nominal output power, the total carrier power is held steady at nominal output power until the RNC congestion control function has taken enough corrective actions, for example, by switching down the data rates. The reaction time of the FCC function matches that of R99 power control (0.67ms), which is to say it is fast enough to fully prevent saturation of the TX chain or overdriving of the power amplifier without the need for power margins. Therefore, cell behavior remains robust at maximum load without running the risk of dropped cells or modulation inaccuracy. Furthermore, the RNC congestion and admission thresholds can be set to higher levels, increasing cell capacity without compromising overall quality of service (Figure 12).

Ericsson estimates that FCC yields up to 25% greater capacity for R99 traffic. For HSDPA, the gain is nearly 50% greater throughput during the "busy hour."

Conclusion

Ericsson's strategy for 3G network development is to release products and features in accordance with customer needs at different phases of network rollout.

The first indoor and outdoor macro base stations were released in early 2001. These products were based on the first commercial RBS design release (RBS R1).

The second RBS design release (RBS R2) improved on the architecture and subsystems in RBS R1 and introduced software support for additional configurations. Ericsson also broadened its RBS portfolio.

The new third release of Ericsson WCDMA radio base stations employs technology advances to improve the architecture of the RBS node to help operators meet changing market requirements and target new business opportunities. The new design enables a doubling of the node capacity, increased coverage, simplified maintenance, and dramatically reduces power consumption. Taken as a whole these enhancements help operators to keep their radio access network-related CAPEX and OPEX low.

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Vägen till den fjärde miljarden

Den som följer telekombranschens utveckling kan få intrycket att det bara är allt mer avancerade tjänster som gäller. Så är det inte. Runt en och en halv miljard människor har fortfarande inte tillgång till varken teknik eller tjänster när det gäller kommunikation. Den fjärde miljarden användare är ett viktigt mål för Ericsson. Frågan är: hur når man den?

I telekombranschen blir "den fjärde miljarden användare" ett allt hetare ämne. I dag landar antalet abonnemang på runt två och en halv miljard världen över. När siffran för inte länge sedan steg över två miljarder innebar det en triumf för Ericsson och telekombranschen. Tillväxten är explosiv och fyramiljardersstrecket är inom räckhåll – det handlar om några år framåt i tiden.

För att nå dit krävs dock en betydande ökning av användare i utvecklingsländer där man saknar fasta nät och där medelinkomsten är mycket låg – tillväxtmarknader (high-growth markets) eller marknader med låg genomsnittlig omsättning per användare (low-ARPU).

Undersökningar på dessa marknader visar att den ofta vedertagna inställningen att invånare här inte vill eller har råd att betala för mobil kommunikation inte stämmer. Det är i stället så att en mobiltelefon förbättrar den ekonomiska livskvaliteten för en fattig familj i mycket större utsträckning än för en rik familj. Statistik visar att användare på mogna marknader lägger runt två procent av sin inkomst på kommunikation. På tillväxtmarknader är motsvarande siffra runt tio procent.

– Det är en myt att den största delen av befolkningen på tillväxtmarknader inte har råd med mobiltelefoni eller att man där inte är beredd att lägga en del av sin inkomst på kommunikationstjänster, säger Michael Bjärhov, Ericssons affärstrateg för produktområdet Radio.

Det finns alltså enorm potential på dessa marknader, och därför beslöt Ericsson under sommarens globala chefskonferens (GMC) att göra satsningarna till ett av fem strategiska fokusområden. Ericssons målgrupp just nu på tillväxtmarknader är de som tjänar mellan två och fem dollar om dagen, och man arbetar för att förstå efterfrågan när det gäller både röst- och datatjänster (*se sid 12-13*).

Nya affärsmodeller

Ansvarig för fokusområdet är Kurt Jofs, i dag chef för affärsenheten Access och från årsskiftet chef för Ericssons nya affärsenhet, Networks. Han betonade under GMC vikten av att utveckla affärsmodeller som gör det möjligt för operatörer att tillgodose kunder med så låg inkomst, samt att paketera lösningar och tjänster som är särskilt anpassade för dessa marknader:

Kurt Jofs

– Fast telefoni har väldigt låg penetration på dessa tillväxtmarknader. Därför krävs innovativa mobillösningar som möjliggör lönsamhet även i glest befolkade områden eller på tillväxtmarknader.

Ett exempel på hur Ericsson anpassar affärsmodeller är satsningen på biobränsle som alternativa energikällor i, bland andra länder, Nigeria (*se sid 10-11*).

Även Ericssons tekniska ledarskap är tydligt på tillväxtmarknader, och då särskilt i Afrika. Expander är Ericssons lösning för radionät och basstationer, utvecklad för att minska operatörernas kapital- och operationskostnader (capex/opex) – en förutsättning för att öka antalet användare. Expander gör det möjligt att reducera antalet siter med 30 till 40 procent. Dessutom ska siterna byggas så att de kan kompletteras allt eftersom utvecklingen fortskrider – och den börjar med 2G (*se sid 12-13*).

Michael Bjärhov förklarar:

– Man kan bygga nät annorlunda på tillväxtmarknader. 3G behöver inte rullas ut landsomfattande utan vi kan bygga 3G på liknande sätt som, till exempel, WIMAX – man sätter upp en 3G-mast på ett ställe för att ge operatörerna möjlighet att utöka först när användarna vant sig vid 2G. Man börjar smått och har hela tiden GSM som alternativ när 3G-täckning saknas, vilket är en klar fördel jämfört med ett WIMAX-nät. Vi jobbar även med att utveckla siter där man kan installera mer komponenter på plats för att göra utvecklingen mot 3G så okomplicerad som möjligt.

Återanvändning

En av utmaningarna för Ericsson här är logistiken. Man behöver få ut basstationer där det kanske inte finns vägar eller elektricitet. Ericsson satsar nu på att ytterligare utveckla Expander för att öka överföringskapaciteten.

– På de här marknaderna handlar det inte om att ta fram separata produkter för olika marknader. För att få en bra ekonomi i verksamheten krävs att man kan återanvända samma koncept, men med nödvändiga anpassningar, säger Henrik Moberg, operativt ansvarig för fokusområdet.

Henrik Moberg

Ericsson satsar även på att utveckla sina erbjudanden inom tjänster. Delade konton (shared accounts) är en sådan lösning – flera människor eller till och med en hel by delar på en telefon och ett abonnemang. Och genom elektronisk påfyllning (e-fill) kan en användare skicka ett gratis sms med samtalsminuter till annan användare (*se sid 12-13*).

Det är alltså efterfrågan på tillväxtmarknader som Ericsson nu satsar på att utveckla produkter och lösningar utifrån. Och om man på mogna marknader talar om att det är informationssamhället som driver utvecklingen framåt, att allt mer avancerade tjänster är det som påverkar användarnas beteende, så är det mer eller mindre tvärtom på tillväxtmarknader. Här måste man först få in kommunikationstekniken som en del av kulturen. Och det gör man genom att få invånarna att ringa ett samtal. •

Läs mer om detta på följande uppslag. >>

> ”Det är en myt att den största delen av befolkningen på tillväxtmarknader inte har råd med mobiltelefoni eller att man där inte är beredd att lägga en del av sin inkomst på kommunikationstjänster.
>
> **MICHAEL BJÄRHOV**

Folkrika utvecklingsländer står i fokus när den fjärde miljarden mobilanvändare ska nås.

text & foto: johan kvickström

Miljöbusiness i Nigeria

Där i australiensiska ambassadens trädgård står den – generatorn som kan vara fröet till en stor mobilexpansion i utvecklingsländerna. Platsen är Lagos, Nigeria. Eller närmare bestämt operatören MTN:s testcenter, beläget i Australiens tidigare ambassad i den västafrikanska jättestaden. Generatorn är det första praktiska testet av biodiesel som ett förhoppningsvis billigare och definitivt mer miljövänligt alternativ till vanlig diesel.

Ericsson har tillsammans med mobilbranschens paraplyorganisation The GSM Association (GSMA) och MTN, ledande pan-afrikansk operatör i landet, dragit igång verksamheten som ännu så länge är ett pilotprojekt. Man testar idén att tillhandahålla "bio-täckning", energioptimerad täckningsexpansion i glesbygdsområden som ska drivas med biodiesel. Men framför allt skulle det innebära att regioner som i dag helt saknar infrastruktur så som elektricitet har råd att skaffa sådan. Intresset inom telekombranschen är stort.

– Det finns ett väldigt stort intresse hos stora operatörer som har verksamhet i aktuella regioner. Ingen fråga är i dag viktigare än miljön, och jag vet ingen annan bransch som har tagit sig an frågan på ett bättre sätt än telekombranschen, säger Ben Soppit, chef för GSMA Development Fund.

Principen för verksamheten är konceptet win-win situation. Tack vare användandet av biobränsle kan vi stimulera den lokala marknaden genom att skapa jobb för lokala farmare eller företag och därigenom förbättra ekonomin i området. Befintliga grödor kan användas vilket kräver arbetskraft, det vill säga ger arbetstillfällen. Arbete ger köpkraft vilket gynnar både leverantörer som Ericsson och operörerna som kan få fler abonnenter som spenderar mer pengar på telekommunikation. För Ericsson är naturligtvis också den omedelbara vinsten att om det finns pålitliga energikällor finns det möjlighet att installera radiobasstationer i de stora områden där täckning i dag helt saknas.

Sedan GSM-licensen och den åtföljande utrullningen av nätet 2001 har antalet abonnenter i Nigeria fullstädigt exploderat. Från mindre än en miljon till närmare 25 miljoner i dag. En stor siffra, men den ska ställas i relation till den faktiska befolkningen.

– Vi har omkring 150 miljoner människor här i landet, så det är en enorm potentiell marknad, säger Leif Edwall som är chef för Ericsson Nigeria som har huvudkontor i Lagos och är centrum för regionen Västafrika. Han fortsätter:

– Nigeria är det största landet sett till befolkning, men hela regionen är cirka 250 miljoner människor, varav det stora flertalet i dag saknar såväl fast telefoni som mobiltelefon.

Saknar elektricitet

Av den väldiga befolkningen bor huvuddelen, kring 70 procent, på landet. Nigeria är Afrikas till ytan näst största land efter Kongo-Kinshasa och människor bor ofta i isolerade områden där täckning saknas. Faktum är att en majoritet av befolkningen saknar elektricitet. Och det är alltså inte minst i sådana områden som biobränsleprojektet kan ge god effekt.

Leif Edwall

Victor Oduguwa

Nigeria är platsen för pilotprojektet, nästan av en slump.

– Det var MTN:s CTIO, Karel Pienaar som valde platsen, berättar Daniel Lundström, strategisk produktchef för sitebyggnation på Ericsson. Han fortsätter:

– Annars är intresset i stort i en del länder med liknande problem: Indien, Kina, Bangladesh men också ett antal andra afrikanska länder.

Pilotsiten i Lagos förefaller liten till storleken men är betydelsefull eftersom Ericsson och dess partner är pionjärer när det handlar om att använda biobränsle inom telekombranschen. Men storleken är en poäng i sig:

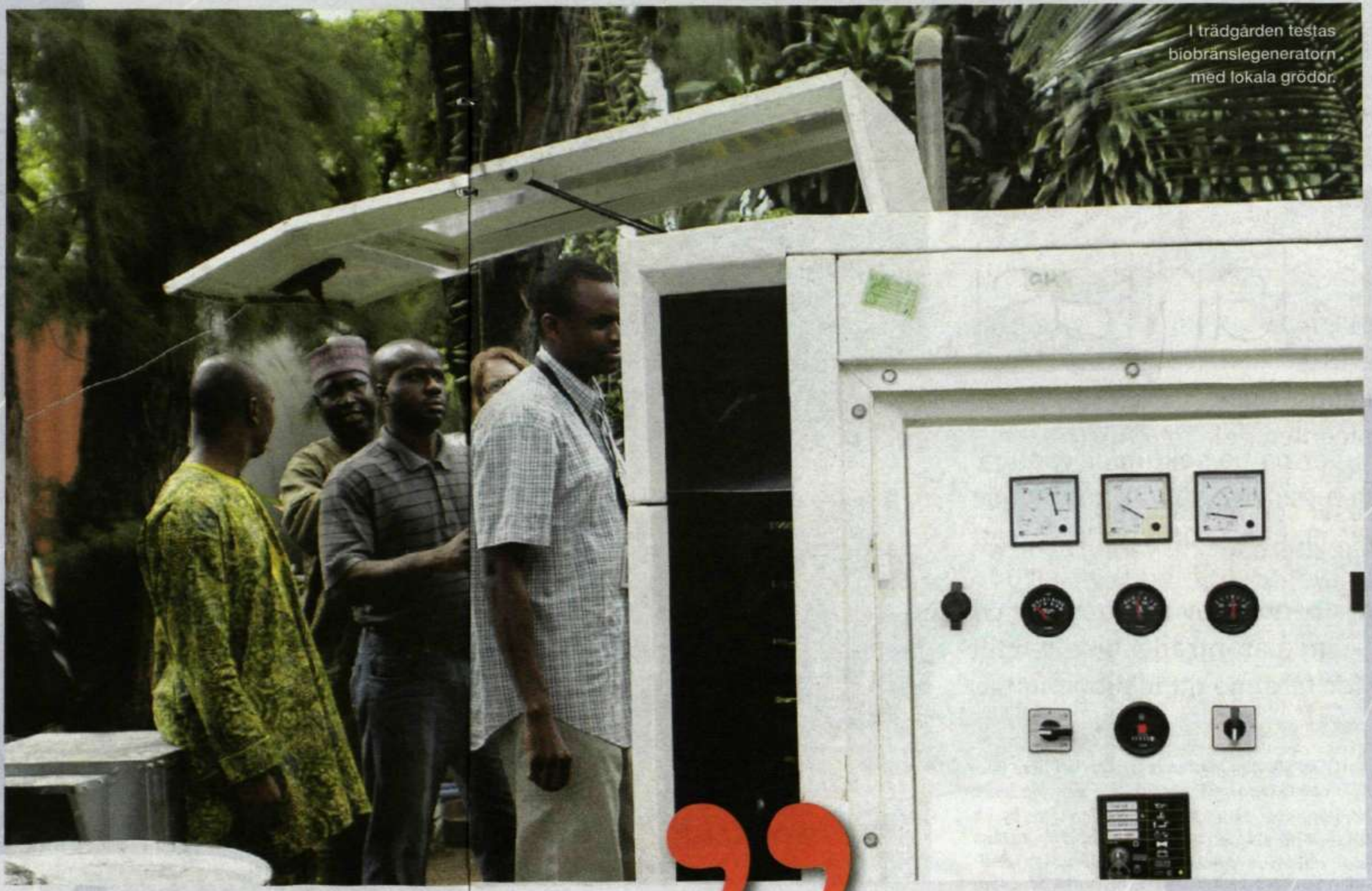
– Det här ska kunna drivas också i liten skala. Viktigt är att det kan anpassas lokalt efter de olika förutsättningar som kan gälla, säger MTN:s ansvarige för pilotprojektet Victor Oduguwa och får höja rösten för att överrösta den bullriga generatorn bredvid.

Fler projekt

I fas två testas olika grödor för att optimera förbränningen. De grödor som odlas och finns tillgängliga varierar beroende på var i världen man befinner sig. I Nigeria är ett av alternativen palmolja. Nackdelen med palmolja är att det tar tid att odla palmer, upp till tre år får man räkna med. Andra tänkbara grödor har andra fördelar. Exempelvis kan de restprodukter som också blir resultatet användas på andra områden, bland annat som gödsel – ännu ett exempel på hur mångbottnat och fyllt av positiva sidoeffekter det kan vara att arbeta med biodiesel.

Den tredje fasen är en förlängning av nummer två. Där ska man titta på socioekonomiska faktorer. Det handlar då om sådant som att hitta lämpliga platser att placera ut generatorer på, samt att finna människor som vill ta på sig att driva generatorer.

– Målet inom överskådlig tid är att vi under första kvartalet nästa år ska ha igång flera pilotprojekt runt om i världen, säger Daniel Lundström. Han fortsätter:


I trädgården testas biobränslegeneratorn med lokala grödor.

> I just Nigeria ser vi i dag en ökning av antalet abonnenter med kring en miljon i månaden. Det stämmer bra med vårt mål på 50 miljoner om två år.
>
> LEIF EDWALL

– När en utrullning sedan sker kommer det att vara i sydöstra och sydvästra Nigeria.

Att Ericsson och en operatör nu tagit sig an att finna bra lösningar för biodieselgeneratorer är ett första steg. Men varken en operatör eller en leverantör kan i förlängningen stå för att driva etableringen och driften av generatorer.

Magnus Mchunguzi

– Det krävs en tredje part för att detta ska gå vägen, säger Magnus Mchunguzi som är kundansvarig för MTN på Ericsson i Nigeria. Han fortsätter:

– Därför finns ett antal viktiga resultat som vi måste komma fram till när vi nu genomför testerna. Vi måste i ett första steg visa att detta faktiskt är en billigare lösning och att det därför finns omedelbara ekonomiska vinster att göra för den som vill investera i en eller flera generatorer. Då måste vi också kunna uppvisa en tillförlitlighet hos systemet. Där efter ska vi visa hur enkelt det är att genomföra, att time-to-market är snabb och vilka övriga vinster som finns att inhämta.

Stor marknadsandel

Slump eller inte, Ericssons ledande ställning i Nigeria är en av flera faktorer som gör landet lämpligt för att testa biobränsleprojektet.

– Vår position på marknaden här är jättebra. Vi dominerar och har en marknadsandel på mer än 50 procent, säger Leif Edwall. Han utvecklar resonemanget:

– I just Nigeria ser vi i dag en ökning av antalet abonnenter med kring en miljon i månaden. Det stämmer bra med prognosen på 50 miljoner om två år.

Leif Edwall ser också ljust på annat än bara en abonnenttillväxt.

– I detta nu genomför Celtel tester med 3G-nät här i Lagos och MTN planerar att göra detsamma. Därför kan vi förvänta oss en utrullning av 3G i en nära framtid i Nigeria.

Trafik för mer avancerade tjänster står alltså också om hörnet, men det kommer i så fall vara begränsat till urbana områden. Den stora tillväxten finns i antalet abonnenter, och där kan det biobränsleprojekt som ännu är i sin linda ha en viktig funktion.

– Utveckling i glesbygden i regionen är nödvändigt. Och där det i dag saknas infrastrukturella möjligheter att erbjuda telekommunikation kan sådana här generatorer ha stor betydelse. Det finns en tydlig koppling mellan människors kommunikationsmöjligheter och materiell levnadsstandard. Alla vinner på det här, säger Magnus Mchunguzi. •

fakta: GSMA Development Fund

Biobränsleprojektet är ett samarbete mellan Ericsson, operatören MTN och GSMA Development Fund. Det sistnämnda är en del av organisationen GSMA och arbetar med att hjälpa de uppskattningsvis 1-1,5 miljarder människor som helt saknar tillgång till mobiltjänster. GSMA Development Fund, som startades i oktober 2005, tar tillvara på och deltar i utvecklingen av telekominitiativ som kan förbättra sociala, miljömässiga och ekonomiska villkor för människor. Vid sidan av biobränsleprojektet har man lyckats bra med så kallad "shared access", det vill säga delad tillgång. Detta går ut på att i länder eller regioner där människor har en mycket liten inkomst kan dessa dela på ett abonnemang och fortfarande ha tillgång till kommunikation men till en lägre kostnad per person.
Läs mer på www.gsmworld.com/developmentfund

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text: staffan j thorsell | foto: ericsson arkiv

Lite prat och mer fantasi

På tillväxtmarknader är samtalslängder på tio sekunder vanliga. Användarna är innovativa och hittar nya sätt att rundgå de fortfarande höga samtalskostnaderna. Ericsson satsar för att utveckla lösningar som är anpassade till användarnas beteende i dessa områden. Visst pyr behovet av datatjänster på tillväxtmarknader – ändå är inträdesbiljetten till informationssamhället här fortfarande ett telefonsamtal.

– Med en genomsnittlig samtalslängd på runt tio sekunder, utan någon storföretagskultur och med låg inkomst på tillväxtmarknader blir mobilsamtalet en investering som behövs om man har en en liten rörelse eller arbetar sporadiskt som dagsavlönad. En hårfrisörska behöver bara hålla öppet när någon vill klippa sig. Butikskunden kan ringa först och berätta kort att han kommer och försäkra sig om att varan finns på lager. Varje samtal kan ses som en investering, säger Michael Bjärhov, Ericssons affärsstrateg inom produktområdet Radio.

Det är en fundamental skillnad – en mobiltelefon gör betydligt större skillnad när det gäller livskvaliteten för en fattig familj än för en rik familj.

Michael Bjärhov

– Tjänar man en dollar om dagen har man inte råd att äga en mobiltelefon. Tjänar man två dollar om dagen är man intresserad av att använda mobiltelefoni som en investering. De som tjänar mellan tre och fem dollar om dagen är ofta redan användare, säger Michael Bjärhov.

För att kunna utveckla mobillösningar som är mer tillgängliga för låginkomsttagarna på tillväxtmarknader och för att ta fram affärsmodeller för tjänster utöver röst, arbetar Ericsson nu med att förstå efterfrågan. Ericsson Consumer & Enterprise Lab (C&E Lab) har gjort undersökningar i, bland annat, Kenya. Där kunde man dela in fördelarna med en mobiltelefon bland låginkomsttagare i fem teman:

- Den genererar inkomst
- Sociala nätverk förstärks
- Den är ett tecken på modernitet och status
- Den stärker infrastrukturen
- Den tillåter direkt, privat kontakt

Levande telefonkiosk

C&E Labs Erik Kruse förklarar hur ett vanligt mobilsamtal mellan två bekanta kan se ut i Kenya i dag:

Siphora, som bor i en kenyansk by, äger en mobiltelefon. Det gör inte hennes mor, som bor flera byar bort. För att få tag på sin mor ringer Siphora en Semu ya Jamii-kvinna i staden närmast hennes mors by. En Semu ya Jamii är en person som tar betalt för att låna ut sin mobil – en levande telefonkiosk. Semu ya Jamii-kvinnan skickar ett sändebud till Siphoras mor, som sedan promenerar de fyra kilometerna till Semu ya Jamii-kvinnan. Där väntar hon på att Siphora ska ringa upp igen. Ibland har hon fått vänta i timmar.

Här blir det tydligt hur fler mobiltelefoner skulle kunna fungera som en investering – Siphoras mor hade kunnat spara tid och pengar genom att slippa ta sig till Semu ya Jamii-kvinnan. Siphora hade istället bara behövt ringa ett samtal. Dessutom hade deras samtal enbart blivit en angelägenhet mellan mor och dotter.

Erik Kruse

– Och vi vet även att en av drivkrafterna, särskilt bland unga människor, är en personlig mobil, alltså att kunna kommunicera privat, säger Erik Kruse.

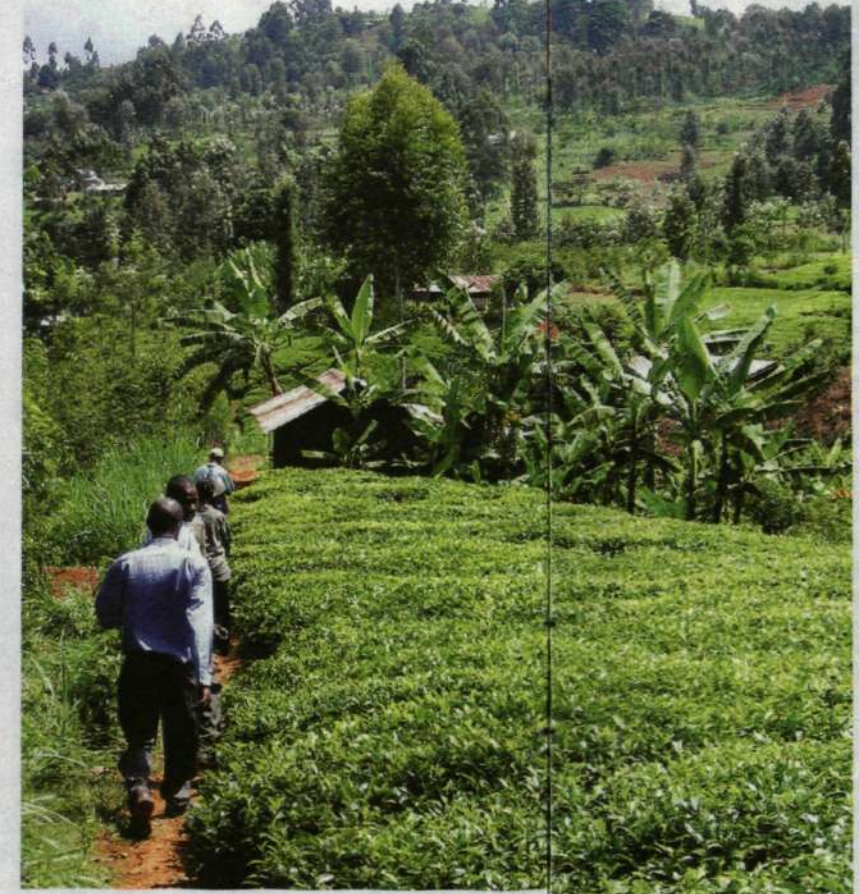
En av de starkaste drivkrafterna är dock den fördel som mobiltelefoni innebär för, till exempel, läkare när det gäller transporter av medicin och andra förnödenheter, förklarar Erik Kruse.

– I sådan avseenden, och för myndigheter, innebär mobiltelefoni en enorm investering, säger han.

Men fortsatt höga samtalskostnader på tillväxtmarknader gör att just användarbeteenden som i exemplet med Siphoras samtal till hennes mor är vanliga. En familj – eller en hel by – delar på ett mobilabonnemang. Trafiken blir alltså mycket hög per användare, förklarar Michael Bjärhov.

– Viktigare än att tala om låg-ARPU är då att man har förståelse för att det på tillväxtmarknaderna finns ett segment som kommer att betala, men också att det finns ett tillväxtutrymme om man sänker samtalskostnaderna. Då når vi de som tjänar mellan en och två dollar om dagen. När människor först upptäcker fördelen med kommunikationen, är det telefonsamtalet som är inträdesbiljetten, sedan kommer datatjänsterna.

Också de mest avlägsna platser ska kunna ha tillgång till mobiltjänster. På bilden en liten by i Kenya.



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Mobil till alla

Här satsar därför Ericsson på att ta fram kostnadseffektiva lösningar för operatörerna på tillväxtmarknader, för att så småningom även nå de med lägst inkomst – fler ska börja ringa.

– Inom it-branschen pratar man om "en laptop till varje barn". Vi kan i telekombranschen göra likadant med mobiltelefoner. Där skulle lösningar kunna erbjuda de som inte kan betala att ringa under vissa tider, och i stället avbryts deras samtal om en person som har större möjlighet att betala vill ringa. Så kan vi skapa nya användare som så småningom kan betala för sig, säger Michael Bjärhov.

I dag ser man hur användare på tillväxtmarknader rundgår de dyra samtalskostnaderna och dyrare datatjänster som sms. Man har sett hur unga använder mobilen som personsökare där antalet ringsignaler har en specifik betydelse. Ett visst antal signaler kan betyda att man är försenad. Det finns även en marknad för GPRS, där användarna kan använda sig av "kompissidor", instant messaging och "anslagstavlor" där de lägger upp information när det gäller, till exempel, var och när man ska träffas.

Det finns, säger Michael Bjärhov, fler exempel som visar på behovet av tjänster där många människor behöver samma information.

– Religion spelar ofta en stor roll på tillväxtmarknader och man har starkare släktband. Ofta kräver, till exempel, högtider att information behöver nå ut till ett stort antal personer. Även mer avancerade tjänster som MMS kan, till exempel, användas för att visa fotografier på nya släktingar när det inte finns fasta nät för e-post. Det finns också behov av enkla informationstjänster – bönder som odlar en typ av gröda får tillgång till prisinformation från samtliga inköpare av den grödan.

Här är dessa applikationer ett alternativ till de dyrare samtalen – och de ofta långa resorna till de byar där varuhandeln sker.

Som en ny typ av valuta

Det finns även en efterfågan på så kallade plånbokstjänster.

– I till exempel Hong Kong finns 100 000 hembiträden från, bland andra länder, Filippinerna. De kan använda sms-tjänster för att förmedla pengar till sina familjer. Dessutom kan man betala med samtalstid genom att man kan skicka "minuter" till en annan persons mobiltelefon. Man kan säga att det uppstått en ny typ av valuta, säger Michael Bjärhov.

Det handlar alltså inte om att i första hand koncentrera sig på att lansera datatjänster, utan om att först förstå hur de med låg inkomst på tillväxtmarknader använder befintliga GSM-tjänster. Det handlar, enligt Michael Bjärhov, om ett helt annat beteende. Till skillnad från de mogna marknaderna är tillväxtmarknader en kultur där det finns mycket få informationssystem, och informationen får man genom att ringa någon som har den.

– På de mogna marknaderna vet alla vilka möjligheter en PC erbjuder och många företag och myndigheter lanserar sina erbjudanden uppifrån och ned, genom den utbildade eliten. Men på tillväxtmarknader erbjuder mobiltelefoni som enda utbredda teknik, en möjlighet att arbeta nedifrån och upp, och fler får tillgång till information. Därför går vi först ut med GSM i byarna – sedan blir det naturligt att lansera fler datatjänster, som till exempel mobilt internet, säger han. •

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Mobile against poverty

Mobile communications can help reduce poverty in emerging markets. And operators, with the right business model, can also make a good ROI

written by
Michael Bjärhov

Mobile communications is a great enabler. Quite apart from the benefits that it is bringing to the more prosperous areas of the world it has the potential to transform the lives and prospects of poorer, more remote communities.

However, for this to happen on any scale, operators and service providers need to adopt new business models. And they have to be convinced that these models are sustainable and will produce a satisfactory return on investment.

This all ties in with the United Nations Development Programme (UNDP) initiative, which is seeking to promote its vision of 'Communication for All'. The aim is to help eradicate poverty in the developing world. And by committing itself to the UN's Millennium Development Goals, the international community has pledged to reduce extreme poverty — those whose income is currently less than US$1 per day — by half by 2015.

The active participation of business is central to meeting this target and the Information and Communication Technology (ICT) sector has a major part to play in this.

The UNDP has been working with the Swedish International Development Cooperation Agency (Sida), alongside Ericsson, to understand the benefits that mobile communications can bring to poorer communities and to develop a sustainable business model that will make it possible.

The perceived wisdom is that the poor have no purchasing power but this is not so. The combined earnings of 680 million households in 20 emerging markets amounts to US$2 trillion and studies by the UNDP indicate that they are willing to spend 5-10 per cent of their earnings on telecom connectivity.

In these markets, the mobile phone is the most accessible and practical form of information communication technology (ICT). However, it's something that needs to be used carefully — every call has to be seen as an investment that must generate a return in terms of obtaining information or generating income.

The business model for bringing mobile communications to the more remote areas of emerging markets calls for appropriate, affordable technical solutions that can be provided with lower levels of investment than before. It also needs to address other important issues, such as the cost and availability of power for the network infrastructure in remote areas.

Huge growth potential

Wireless Intelligence, the joint Ovum and GSM Association venture, predicts that by 2010 there will be more than three billion mobile subscribers across the world — a substantial increase on the present number. If this ambitious growth is to be achieved, the majority of new subscribers will have to come from developing markets, notably those in Asia, Africa and Eastern Europe.

These currently less-prosperous markets are going to need kick-starting, unlike the more affluent areas, which have grown continuously for many years but are beginning to approach saturation with slowing momentum.

Generally speaking, today's 2.5 billion subscribers represent the more affluent sections of the world. This still leaves two-thirds of the world's adult population without mobile subscriptions although many of these people have used a mobile phone at some time or another.

All this presents operators with a challenge and an opportunity — achieving subscriber growth in less affluent markets in cost-effective and profitable ways. This can only be done by providing the cellular capacity and coverage that makes it possible for everyone who wants a mobile phone to have one. In urban areas, new subscriber growth will put more pressure on existing capacity, while in rural areas the challenge is to provide cost-effective transmission and coverage that will make network extension viable.

African network expansion

One African mobile operator that is going for growth is Celtel, which has been actively improving its networks in several countries, including Sudan, Democratic Republic of Congo, Sierra Leone, Gabon and Chad. Most recently, the operator has upgraded its GSM network in Uganda and Tanzania as part of a major network renewal project.

Using high-capacity base stations, Celtel has been able to reduce the number of sites needed for initial rollout and achieve flexible capacity and coverage expansion - resulting in better coverage for lower investment.

In this way, Celtel managed to double its coverage across Uganda, giving it the ability to offer mobile access to a much larger share of the population. In addition, the operator has succeeded in improving service quality for its Tanzanian customers. The base stations have been also ready for GPRS/EDGE, allowing a smooth future transition into 3G services

A recent Yankee Group report shows mobile penetration rates in Uganda and Tanzania of between three percent and four percent respectively. The same report ranks Africa as the world's fastest growing region for mobile communications over the next five years.

This is good news for Celtel, which currently operates in 13 different African countries and is well positioned for expansion across the continent.

Cutting capital and operating costs

What are the main areas of capital and operating expenditure (capex and opex) that need to be addressed to allow operators of GSM/EDGE services to provide affordable access to less well off communities?

Radio networks typically represent 70 per cent of the cost of a complete mobile network, so any savings in this area will have a great impact on total infrastructure costs.

With new technology solutions it is possible to reduce the number of radio sites required by up to 50 per cent. Other substantial cost reductions can be obtained by using pre-configured radio base stations (RBS), site materials, antenna power and installation systems, transmission and services. A scalable core network, using a transmission-efficient mobile softswitch architecture, can generate additional savings.

The result can be a saving of up to 25 per cent in capital outlay against traditional methods, a similar reduction in power consumption and significant savings on civil engineering and core network opex. All this contributes to a significant cut in the total cost of ownership, brought down by 30 per cent or more and contributes to further savings in rollout and time to market.

Photo courtesy of Ericsson

▸ School children in South Africa get connected

Advanced radio features and modular base station systems that can adapt flexibly to different coverage and capacity needs are another key factor in reducing the costs when expanding the radio network.

Providing coverage across large areas often involves bridging vast distances and challenging territory. Often there is little or no existing infrastructure in the form of cables in the ground, and laying copper or fiber is either physically impossible — for example, in mountains — or commercially unviable. For these reasons, microwave transmission has become the preferred transmission method in many emerging markets, reducing entry and running costs as well as contributing to a faster time to market.

Another problem that often needs addressing in remote areas is access to power networks. For those sites without access to the electricity grid, alternative sources can be used. These can include solar, wind, bio-fuel and fuel cell technology.

Where there is more than one operator active in area shared ownership of infrastructure can be another factor in reducing the costs and risks for all parties involved.

A model for Tanzania and Kenya

Studies conducted in Tanzania and Kenya in the last two years, as part of the 'Communications for All' project, clearly show that mobile communications is the most accessible and practical form of information communications technology (ICT) for rural and poorer communities. They revealed that 97 per cent of village populations knew about mobile telephony and half had used a mobile phone but 67 per cent did not know what a computer was and a mere three per cent had ever used one.

In Tanzania average ownership of mobile phones stands at just five per cent but over 50 per cent aspire to have one.

The biggest impact of mobile communications in both Tanzania and Kenya is economic. Mobile phones open up opportunities for business, facilitating trade and providing access to buyers and sellers. Local shopkeepers benefit from the sale of top up cards, providing repair services and also offering recharging services for mobile phones in communities where there is no electricity.

Social networking is important too. Families can be widespread and other forms of communication can be difficult and unreliable.

The studies have also shown that a mobile phone is affordable for families with incomes of US$3 per day or more. Even so, the phone must be used sparingly. The average spend is between 10 to 20 per cent of income, and a typical 'social' call lasts around 10 seconds while business calls continue for about one minute.

The Tanzanian study indicated that US$50 was an acceptable handset cost while most people were willing to pay up to US$0.50 for a one-minute call. The Kenyan study showed that people tend to save up for their handsets, rather than borrowing money in order to purchase a mobile phone.

Good
PHONE
FOR
RENT

Photo courtesy of Ericsson

▸ Spreading the word in Kuala Lumpur, Malaysia

While the main benefits are economic it is clear that possessing a mobile phone gives people a greater feeling of self-worth, confidence and hope.

Mobile communications has an impact on the wider society in areas such as access to health care, education, finance, security and even fighting crime and corruption.

In addition to providing basic communications services, there are also many follow-on opportunities for revenue generation once a network is in place. For example, SMS messaging can account for a significant part of operator revenues and it is not unusual for the SMS volume to significantly outnumber voice calls in rural communities.

Internet access can also be provided for isolated schools, hospitals, police stations and farms, for example. For more advanced users, PC cards in laptops can provide data and fax services via the mobile network. Initially, Internet access can be delivered by GSM/EDGE technology but this later can be upgraded to WCDMA/HSPA.

Meeting the goal

Technology is not the only matter to be considered. There are many local political, societal and operational issues. Nevertheless, finding technical solutions opens the way for serious future development, of the sort if growth statistics are to be realised.

Governments need to be persuaded not to tax mobile phones and services as luxury items. A GSM Association survey indicates that if all taxes and duties were removed from mobile handsets, penetration would rise by 20 per cent. The commercial environment is also vital: open competition, with adequate safeguards, is needed to ensure low prices and consumer choice.

With access to affordable handsets, shared usage and low tariffs, mobile communications can be made widely available, especially as many people use their phones primarily to receive incoming calls. Low top-up denominations for prepay services appeal to consumers with less than a dollar to spend. At the same time, it must also be simple for them to sign up and stay connected.

The United Nations' Millennium Development Goals, to halve extreme poverty by 2015, are ambitious. There are those who think it cannot be done. And while no-one would suggest that mobile communications can do this on its own, it can certainly contribute to the economic and social well being of poorer communities. The technical and business models exist to make it not only possible but profitable for operators and service providers. ◂

Michael Bjärhov, *head of Ericsson's 'Communication for All' programme*

Michael Bjärhov and Elaine Weidman on

why you can't put a price tag on communications

The broader value of communication

The poorer you are, the more valuable communication is. People with little money are often willing to spend up to 40 percent of their earnings on mobile services. To them, each call is an investment from which they expect a positive return. And the value of communication is by no means only monetary. Understanding this broader value concept is crucial to every business strategy that targets the bottom of the income pyramid.

THOSE WHO FOLLOW THE DEVELOPMENT of the telecom industry could get the impression that advanced services are all that matter, and that games and entertainment are driving the evolution of communications. However, billions of people still lack access to communication services in a world where even a simple mobile phone call or SMS can make a huge difference to a person's life. The challenge is to reach this untapped market, and once that hurdle is overcome, to provide the kinds of services that fulfill people's needs and aspirations.

Companies with a committment to corporate responsibility – that is, which conduct business in a way that meets social, environmental and ethical concerns – wrestle with the fundamental question of how they can apply their products and services for the betterment of society. For the telecom industry, realizing the broader value of communication is about using the full potential of our core technologies to ensure there is a positive impact on human lives. It's about offering the kinds of services that can literally change lives while still making a winning business proposition.

Mobile phones have implications for society as a whole. Mobile communication can improve access to education and healthcare services – even government efforts to fight crime and corruption are strengthened when people have access to mobile phones.

An SMS can mean so much

Many studies show how important information and communications technology (ICT) is to development and growth. In this context, mobile communication is one area that can make an immediate and direct impact both on the daily lives of the poor and, just as important, on the business economies of some of the world's least developed nations.

ICT is about having access to information. It starts with calling somebody who has the information you want. When you need more information it can be evolved to provide specific services or to give access to any application on the internet. The collective strength of providing basic telephony communication while offering affordable data services and internet access to institutions and individuals characterizes wireless systems. Whatever the level of information required, mobile systems are well suited to delivering a relevant service.

For society, the broader value of communication is about providing basic services, such as healthcare. An SMS, for example, can be used to transmit data from HIV/AIDS patients to their doctors. Or it could register a birth in a country where the infant might otherwise not have been counted, thereby avoiding a life without access to government services. It's about lessening the toll on the environment – avoiding a two-day trip on a bus to borrow money from a relative who isn't there. And, crucially, it is about helping to alleviate poverty, using mobile communications to generate new sources of income, and in some cases, establishing a livelihood.

Cutting transfer costs

Mobile banking is taking off in the developing world. According to The Economist, about half a million South Africans now use their mobile phones to do their banking. More than half the adult population in South Africa lacks a bank account but, significantly, 30 percent of these people do have mobile phones. Mobile banking not only provides easy access to credit, but also establishes a financial identity for individuals who have never had the opportunity to build a business and improve their livelihood. In Kenya, Safaricom has launched a new mobile financial service called M-PESA, which targets millions of people who don't have traditional bank accounts.

Global remittances represent an enormous untapped market, estimated to be worth more than USD 200 billion per year. At the same time, remittances stand to serve millions, and ultimately billions, of people around the world who lack basic banking services, in many cases because of a lack of credit history. And these mobile services will drastically cut the cost of cash transfers compared with traditional banking.

Studies of emerging markets show that an increase in mobile use contributes to economic development and higher GDP, making continued expansion a win-win solution for everybody. Statistics from the GSM Association's Global Mobile Tax Review 2006-07 show that for every increase of 10 percentage points in mobile penetration, there is an increase in GNP of about 1.2 percent. A recent GSM Association report by McKinsey suggests that this figure, when considering the cumulative, or flow-on, benefits of the increase in mobile phones, might be closer to 8 percent.

Ericsson's own research, which looks at the economic impact of mobile phones at the household level, shows that the poorer people are, the more they are prepared to spend on communications, because it fulfills basic needs. Thus, the benefits of mobile communications to the low-income segment are so substantial that people are often willing to redirect a higher-than-expected portion of their earnings to mobile services – typically 10 percent and in some cases up to 40 percent. For this segment, each call is an investment that is expected to provide a positive return.

In 2007, more than 3 billion mobile subscribers will contribute to the global economy, an economy that depends on instant and reliable communication. But only a small fraction of these users will use advanced services. The first challenge is to provide the

access that will enable the industry to reach the next billion users; the next is to introduce useful and relevant services for vastly different markets.

Simple yet powerful services

In lower-income segments, communications translates into simple but powerful opportunities that save time and money, and create new revenue opportunities. Mobile health and education are also important opportunities for emerging markets. For example, people in remote areas can call ahead to pre-order medication and therefore avoid a wasted trip to the pharmacy.

The mobile connection can also generate additional income, for example, when day laborers call employers to line up work, or when a business owner orders supplies only as needed. Mobile phones in themselves contribute to the generation of new business opportunities for entrepreneurs, such as selling top-up cards, phone repairs, and in offering to recharge phones for subscribers in communities without electricity.

Simple mobile services, such as mobile banking or e-health transactions, can revolutionize social and economic development. Based on the sheer number of people that see these services as a necessity these basic services may well comprise the majority of traffic volume in the future. At the same time, these are the services that can create profitable and viable business cases for operators in emerging, yet high-growth, markets. Today's new users may well be tomorrow's advanced users, so the value of capturing each additional subscriber is significant.

Emerging markets are good business

The emerging markets of today are likely to become the fully fledged, world market drivers of tomorrow, based on the sheer number of people who are demanding communications services. The demand for affordable services is building momentum among operators in high-growth markets that will be difficult, if not impossible, to stop. It will create new levels of profitability that will challenge the developed markets.

In markets where lower-income levels are prevalent, and people live on USD 1-3 per day, operators are forced to be lean in their operations. Achieving profitability with such low user-spending levels is no simple feat. It is this cost pressure that will potentially revolutionize the telecom industry, as these operators create new business cases to meet their burgeoning markets. The more established players have begun to take note of how this evolution is taking shape. Indeed, we are already seeing examples of how operators, such as MTN in South Africa, with its MTN@ccess project, are beginning to take advantage of this potential (see p. 34, Internet for All).

In Bangladesh, the flow-on effect of mobile communication is illustrated by GrameenPhone, which started with a simple business idea of a village phone in the late 1990s. Today, it is an established business, bringing connectivity to millions. (see p. 37).

For the industry and society, there are mutually beneficial reasons for wanting to expand into these new markets. For the people in these areas, it brings the benefits of communication and all the services that it can bring. And establishing a mobile network is far less costly and easier to maintain than establishing a fixed network. But more than this, better access to communications can help to lift a country's economy by stimulating business and creating revenue opportunities.

Shaping more sustainable societies

Environmental groups such as the World Wildlife Fund (WWF) have begun to understand the possibilities of applying telecom solutions to drive sustainability. WWF, together with the European Telecommunications Network Operators' Association, has launched a broad campaign, At the Speed of Light, that examines the impact telecom can have on energy consumption and the level of carbon dioxide emissions. With advanced telecom solutions, countries such as India and China have the potential to leapfrog some of the unsustainable consumption patterns of the Western world, thereby avoiding carbon dioxide emissions.

With almost 3 billion people connected already, mobile communication is most likely to have the biggest impact on social and economic development. Indeed, concepts that can utilize or take advantage of the benefits of the mobile phone, such as micro credit, are already being heralded as important factors in attaining greater social freedom and release from poverty. Muhammad Yunus and the Grameen Bank jointly received the 2006 Nobel Peace Prize for their work with micro credit and the important part it plays in societies where women in particular have to struggle against repressive social and economic conditions.

Operators in developing markets are now delivering services in urban areas and want to expand to outlying communities. But in rural regions that lack basic infrastructure they often must start from scratch.

There are numerous solutions under way, from microwave technology to alternative energy sources, such as solar, wind, biofuel and fuel-cell technology, combined with the most energy-efficient base stations available. The Ericsson-GSM Association Development Fund biofuels projects, for example, with MTN in Nigeria and Idea Cellular in India provide a source of power that enables mobile connectivity. What is more, the locally produced biofuel products contribute to the local economy, creating a ripple effect in the social and economic development of rural communities.

Understanding the broader value of communications presents an opportunity to make an active contribution to economic and social development in parts of the world that are quickly emerging as vital contenders in the global market. It is also an opportunity to be part of trends that are reshaping and redefining how we think about communications, and along the way, creates new business models that will be as profitable for operators and service providers as they are for the people who will benefit from communications in their daily lives.

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Mobile Money Systems: Mobile Bank: M-Bank

Michael Bjärhov is a swedish engineer with engineering degree at Chalmers University of Technology. Michael Bjärhov is a Director (business), Government & Industry Relations[1] at Ericsson, swedish multinational telecommunication company. He has held several executive positions; Vice President of Sales and Vice President of Product Management Business Strategy Ericsson Radio Systems[2]. Director in charge of Ericssons "Communication for All" programme[3]. Michael Bjärhov founded Ericssons Resource & Competence Center in Selangor, Malaysia.[4]

Michael Bjärhov's publications focuses on mobile technology and mobile money systems, with a particular emphasis on new-growth markets and emerging economies. Some of the topics that his work covers include GSM network solutions for new-growth markets[5], the broader value of communications[4], mobile money systems and the strategic uses of mobile phones[3]. Michael Bjärhov's articles subject matter are telecommunications infrastructure, to policymakers and researchers promoting equitable development[2]

Published work authored by Michael Bjärhov include publication in Telecommunications International[3], Ericsson Review[5][6], Ericsson Business Review[4], and reference in various academic publications [7][8], industry reports [9][10][11]conferences[12] [13] and books [14][15][16]

Michael Bjärhov's work is referenced to in news articles[17][18][19][20] and publications in Africa[21][22], Caribbean Islands[23] and Latin America[24][25][26]. Countries where relevant research is conducted and referenced to are Mexico[27][28][29][30], Ethiopia[31], India[1], Cape Town[32]Nigeria[33] and United Kingdom [34].

His work has contributed to discussions and initiatives related to equitable development, particularly in the context of telecommunication infrastructure and its implementation in emerging economies for monetisation.

Michael Bjärhov is a recognized expert in the field of telecommunication, with a focus on mobile technology and its potential for emerging markets and development of mobile money systems and M-Banking in growing economies in new growth markets.

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